THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LV. No. 1404.] LONDON, APRIL 8, 1890. [42ND YEAR. Price 6d.

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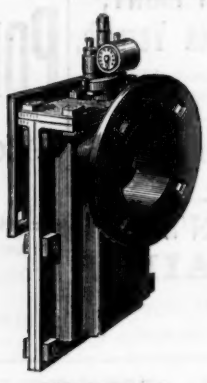

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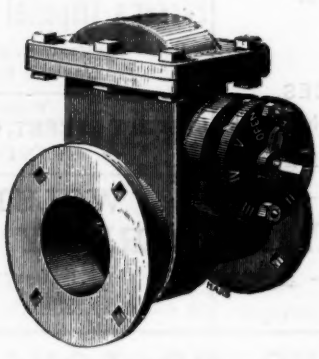

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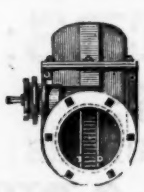

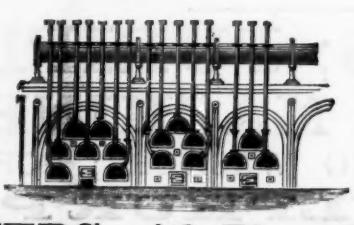

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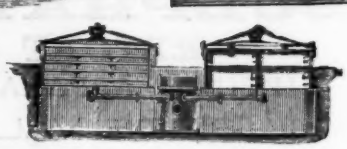

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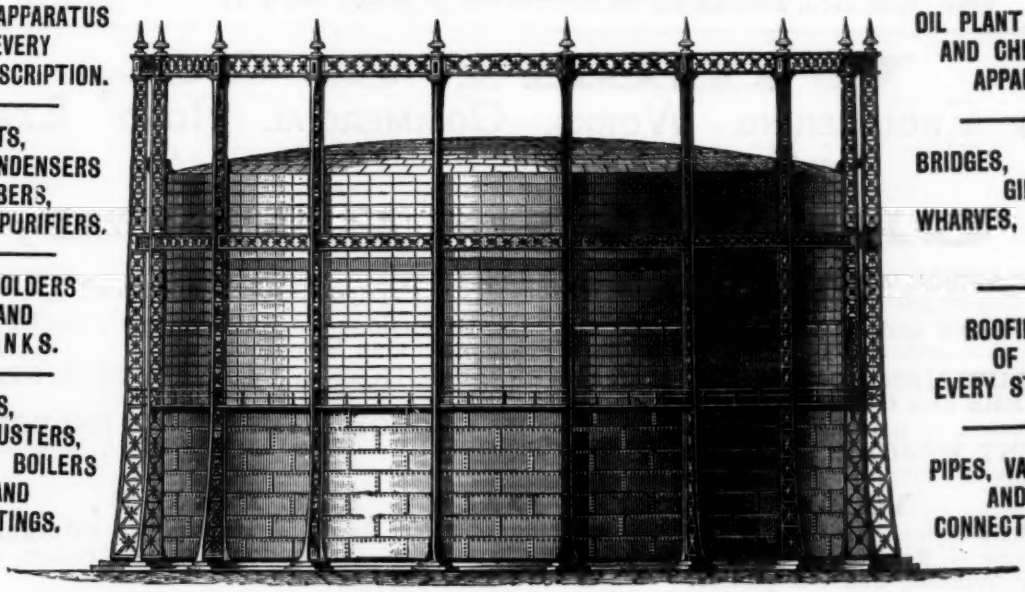

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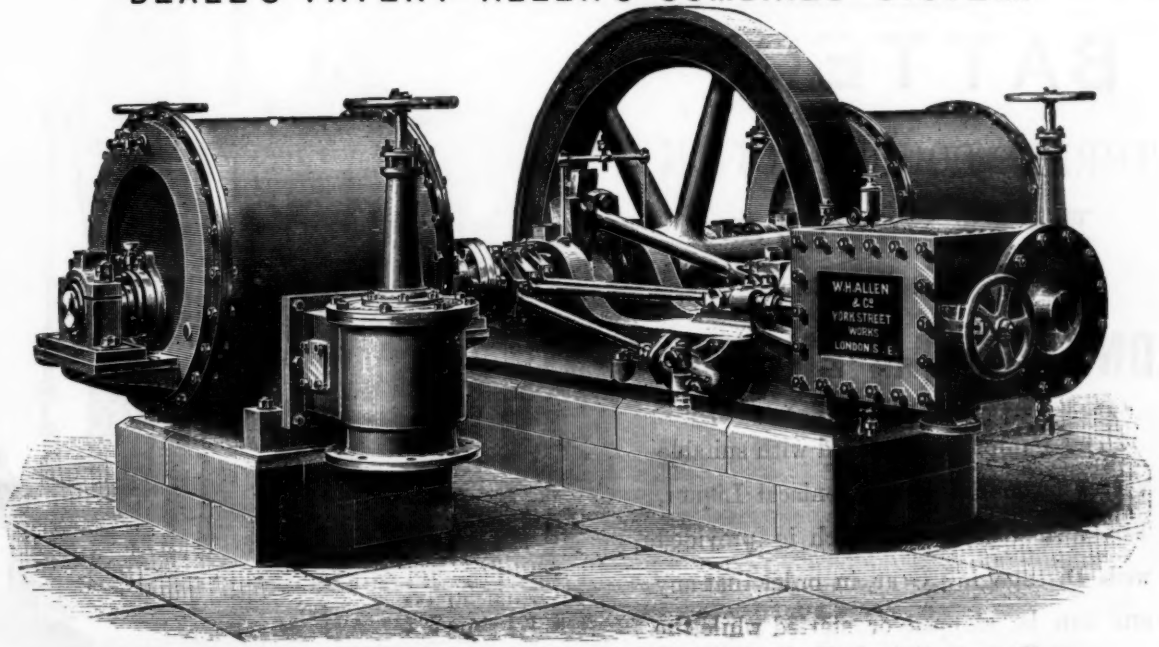

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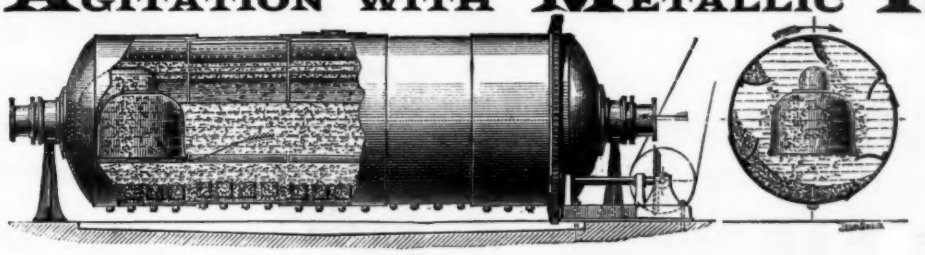

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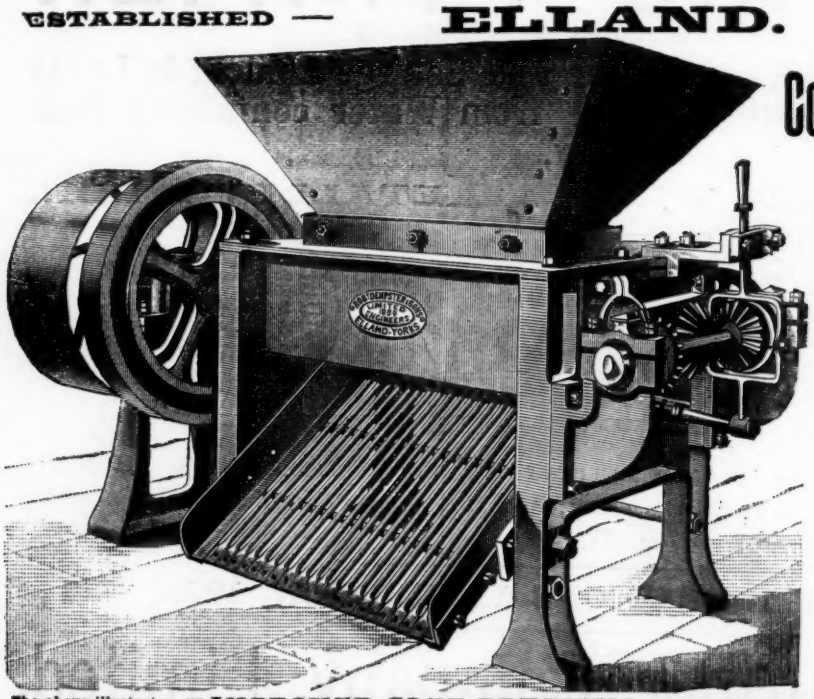

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3	8⅝	15	11¼
5	9½	16¾	13
10	10¾	19	15
20	13¼	24½	18½
30	16⅛	27½	21¼
50	20¼	33¼	26
60	21	33½	27
80	24¼	40½	31
100	25½	42¼	33¼
150	27¾	50¾	42
200	30	56¾	42¾
250	34¼	58	46¼
300	38¼	63¼	49¼
400	41¾	72¼	56¼
500	46	74	57½

150 Lights and upwards.

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3	⅝	0·125	18
5	¾	0·160	30
10	1	0·3	60
20	1¼	0·5	120
30	1⅜	0·830	180
50	1½	1·428	300
60	1¾	1·6	360
80	2	2·5	480
100	2	2·857	600
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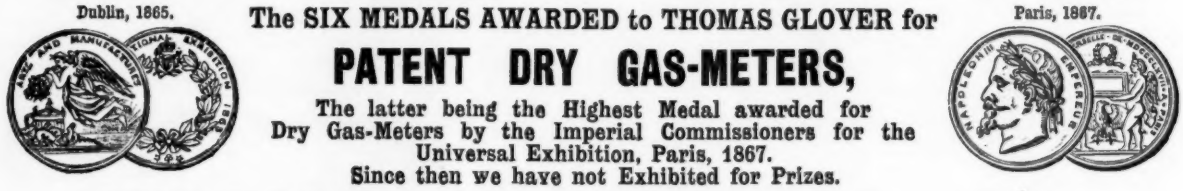
Dublin, 1865. Paris, 1867.



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8th—Cannot be tampered with without visibly damaging the outer case.
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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 8, 1890.

A View of the Prospects of Native Mineral Oil and Natural Gas in England.

THE discovery of coal in Kent, to which reference has already been made in these columns, has been the incentive to other remarkable reports of discoveries, or expectations, of strange fuels in different parts of the country. The most conspicuous of these have reference to the supposed presence of mineral oil in the Cleveland iron district, and of oil and gas in connection with the salt deposits of Cheshire. It is scarcely necessary to examine the arguments that have been advanced for and against both these prognostications of oil and gas "finds." The prudent man takes little account of predictions professedly based on geological data until they are justified by the facts, especially when the prophets are not generally recognized as authorities on the science of geology. This is one of those branches of human study in which a tolerably quick reader may in a surprisingly short time gather a wide smattering of what to the multitude will pass for knowledge. The obvious connection of the coal measures, of metallic veins, of fossil manure, and other products of the rocks useful to man with certain easily-recognized formations of the earth's crust, is very easily remembered; and thereupon a prophet may plausibly found a variety of predictions calculated to inspire awe in the uncritical public, and to excite the speculative fever in a few venturesome people. No credentials are required of the ordinary geological prophet. All he has to do to get a hearing is to send to a newspaper a letter sufficiently peppered with references to well-known geologists and their views respecting the possibilities of finding coal, or oil, or whatever may be the subject of popular interest for the moment, in a given formation known to occur in a particular district, and, having strengthened the general argument with a particular analogy or two, the prophecy of the probability of the special "find" in question occurring in the district is uttered and circulated for what it is worth. It may happen that a prophecy of this character, based upon that "little knowledge" which was once thought "dangerous," before it became the salient characteristic of an age of superficial instruction, turns out to be true; but the chances in its favour are no more than for the reliability of the divining-rod in the hands of a man who "knows the country." It should be borne in mind that a really competent knowledge of geology is as difficult to attain as a smattering is easy to pick up. When an authority like Prestwich ventures upon a statement of probabilities in regard to the strata underlying a particular region, and their useful contents, the opinion is worthy of respect; but it never pretends to prophetic assurance. Geology has too many surprises for the student to justify any man in feeling quite confident about the particular occurrence of those features of different parts of the earth's crust which are so important to the inhabitants of various divisions of its superficies. We may learn the general lessons of the Book of the Rocks with sufficient completeness to speak in confidence of their tenour. The merest tyro, for example, would know better than to search for signs of coal in a tertiary gravel; nor would he expect to find grindstones in a granitic mountain. It is notorious, however, that some of the most momentous miners' finds have not been suspected as possible by men trained in geology. The possibility of gold being found in Australia, and of diamonds occurring in the rocky clays of South Africa, was equally denied by geologists; and the richness of the Pennsylvanian limestones in mineral oil and gas did not enter into the calculations of the geologists of the pre-petroleum age. Nor should these facts be laid to the discredit of geology. It should be remembered that geologists do not pretend to a knowledge of everything down in the bowels of the earth, but merely to the possession of a systematized collection of facts relating to so much of the earth's crust as has been brought to the light of day. To the geologist the truth of the earth's history is the chief and sufficient study of his life. The commercial value of any particular rock or component of a stratum of the earth's crust is nothing to him. To the business man interested in copper or oil it seems absurd that geologists should not know more about the situation of underground metallic veins and oil reservoirs than about the commercially valueless schists and sandstones which share their attention; yet so it is. Geology refuses to bear the yoke of commerce; and those who would press it into the service make the attempt at their peril.

Wherefore, although it would be rash to deny the possibility of some districts of the United Kingdom yielding oil to the borer, while others may possibly yield gas, it would be foolish to build upon either prospect, especially as the subsoil of these islands has been pretty deeply pricked in a great many places without either oil or gas having been found in paying quantities. If a large yield of oil could be obtained anywhere within the bounds of the United Kingdom, it would naturally depress the petroleum market; but the importance of the consequences of such a

find to the established oil and coal gas interests may easily be over-rated. The same may be said of natural gas. With the experience of the natural gas regions of the United States before us, we do not hesitate to say that if gushing gas-wells were opened in any part of the kingdom to-morrow, their influence on the general manufacturing interest of the country would hardly be perceptible. A few factories for boiling brine, making glass, or rolling rails would spring up in a fresh place; but the selling values of none of these products would alter. It is doubtful, for example, if it would pay the Welsh works where Siemens steel is produced to purchase natural gas rights, if they could be obtained, and to abandon their existing generator furnaces. In a country previously destitute of fuel, a find of mineral oil or natural gas is of inestimable value, as may be seen in the case of Central Asia, which is being redeemed from barbarism by the aid of Caucasian petroleum. While we have coal in Great Britain, however, we do not want any other fuel.

An abundant supply of native petroleum would, of course, make a great difference in the character of the national industry of gas lighting; but the premiss is too far out of range at present to render the conclusion worth talking about. The use of fuel more and more largely in the gaseous state is doubtless a point of advancing material civilization; and happily we know how to convert our solid fuel into gas or to use it in its original condition, to suit our own convenience. If there were no possibility of effecting such a conversion, it might be easy to argue that we stand in an unfavourable position, as compared with the United States, with regard to those manufacturing industries for which gaseous fuel is preferable. As it is, there is no real support for such arguments. Those landowners can bore for oil and gas who feel so disposed. In the meantime, the British manufacturer can obtain all the gaseous fuel he needs from the coke which he can buy at the nearest gas-works.

The Commercial Gas Company—Gas Making during the Strike.

THE Commercial Gas Company held their general meeting last Thursday, when the new Chairman, Mr. J. B. Gill, made his first appearance in this capacity, and, it must be said, gained golden opinions from the assembled proprietors. Mr. Gill is a good speaker, with an evident command of his subject, as the head of a great Gas Company, and a self-restrained manner that inspires confidence in his business ability. The beginning of the meeting was tinged with melancholy in consequence of the recent ravages of Death among the Directors; but the interest revived when the Chairman came to speak of the strike, in doing which he took the opportunity of complimenting Mr. George Livesey. From the Chairman's remarks on this subject, supplemented as they were, at the close of the meeting, by some interesting words from the Engineer, Mr. H. E. Jones, it appeared that at one time the Company were in serious difficulty with their stokers, who had become infected with the *Labour Elector* doctrine of the supreme virtue of laziness. Fortunately, the representations of the Engineer sufficed to bring the men back to a sounder way of thinking; and thus a great catastrophe was averted. Of course, it was admitted that but for the discomfiture of the mushroom race of demagogues at the hands of Mr. Livesey, the difficulties of the Company would have been enormously greater. It is increasingly evident that if the South Metropolitan stokers had triumphed in their rebellion, the consequences to London would have been of the most serious kind. As it was, the Commercial Gas Company passed through a trying time, when all the resources of the engineering department must have been strained to the uttermost to keep up the supply of gas to the district. As Mr. Jones very properly admitted, the most trying, if not the most responsible posts in this period were those held by the Company's sub-engineers and works foremen. To their steadfastness the Company owe much. Indeed, every gas-works superintendent and foreman throughout the Metropolitan area had such a trial during the past winter as will leave traces on some of them for life. The Companies ought to remember them, because for most the work and anxiety of keeping up the supply of gas were almost as arduous as if the stokers had actually been on strike. Week after week saw the gas-works of London practically in the possession of the stokers; for not a foreman or engineer dared to utter a protest, howsoever the work of gas making was performed. The South Metropolitan officials, with their raw but willing hands once safely convoyed into the works, had less anxiety, if more labour in drilling the levies, than had some of the managers of other works, in which scarcely veiled insurrection prevailed, in keeping the old gangs to their duty. The men lost their heads for the time; but they have learnt by now that the old ways are not to be abandoned with impunity at the bidding of false guides.

Gas Affairs in Dublin.

THE speech of the Chairman (Mr. E. Fottrell) at the recent half-yearly meeting of the Alliance and Dublin Consumers' Gas Company, a report of which will be found elsewhere, is probably the last that will be heard of the late disagreement and arbitration proceedings between the Company and the Corporation. This performance cost the Company £3000, and the Corporation probably as much—all the result of bad faith, bad temper, and bad policy. Who was to blame for the disgraceful state into which the relations between the Corporation and the Company had been allowed to drift, cannot, of course, be ascertained. Each side would probably accuse the other of being first to give offence; but now, for a time at least, there is a fairly good imitation of peace between the contending parties. Immediately after the arbitration *fiasco*, it looked as if both sides were ashamed of themselves, and had awakened to a proper sense of the absurd figure they made in the eyes of the world. It was rumoured that the ring-leaders of both factions were prepared to shake hands and for the future behave like sensible men of business, instead of like fretful children. The Gas Company had, indeed, every reason to display a conciliatory spirit, seeing, as the Chairman reported yesterday week, that the honesty of their charges was triumphantly established by the agreement which terminated the litigation. The dual control of the street lamps—a fruitful source of bickerings—was also put an end to at the same time; so that there seemed little left for the Corporation and the Company to quarrel about. It is clear from the Chairman's speech, however, that matters between the two old enemies are little, if at all, easier than they ever were. The address was a long diatribe against the Corporation, in which the hatchet, supposed to have been buried last autumn, was exuberantly flourished over the head of the traditional foe. Again was the Corporation accused of bad faith; and again were the irritatingly depreciatory Corporation tests of the Company's gas complained of and disputed. Therefore we conclude that the existing lull of conflict on the banks of the Liffey is not a real and lasting peace. The men on the two sides are not peaceful towards each other; whence it may be regarded as certain that there will be trouble again before long. It does not greatly matter what the occasion may be—one will be found (or made) when it is deemed a favourable time for renewing hostilities. One satisfactory piece of intelligence transpired at the meeting, which was that the Directors have abandoned their futile peddling in electric lighting. They never did, and never could, make anything but a dead loss out of this ill-advised departure; and they are probably glad to have, in the new requirements of the Board of Trade, a decent excuse for quitting a position they should never have attempted to take up. Their example ought to be a sufficient warning to any British gas directors who may yet be inclined to look favourably on proposals to combine the two enterprises of gas and electric lighting.

The Law and Practice of the Referees.

THE Notification of the Metropolitan Gas Referees for the coming summer shows, besides the usual seasonable alteration of the amount of permissible sulphur, a change of wording that is scarcely likely to please the Examiners. In the previous Notification, the instructions for the photometrical portion of the work of the Examiners began by stating that "the testings for illuminating power shall "be three in number daily, to be taken at intervals of not "less than one hour," and proceeded to lay down what was to be done in case discordant results were obtained. This direction was regarded by the corps of Examiners as requiring additional work, or at least as entailing on them a longer daily attendance at their stations than they had bargained for. Consequently, they asked for compensation; which was not at all to the mind of the authorities concerned. In the new Instructions, therefore, it is shown

that the requirement to spend three hours at their testing-stations is not a motion originating with the Referees, but is found in the terms of The Gaslight and Coke and other Gas Companies' Acts Amendment Act, 1880; the words of the Act bearing upon the point being quoted. This is, of course, done for the purpose of overawing the Examiners, and quelling their demand for compensation for extra time spent at the stations, by showing that this was the condition under which they took up their appointments. All the same, however, the practice has been otherwise; and the new order of the Referees does, in fact, constitute a departure from permitted custom—a custom, moreover, which worked well enough before the Referees became infected with their existing restlessness, or reforming zeal as Mr. Vernon Harcourt would probably term it. Since the Referees are so ready to cite the letter of the law for their own ends, when they wish to impose their will upon the Gas Examiners, one is constrained to ask how they would like the same treatment for themselves, with reference (say) to that enactment which requires one of them to have "practical knowledge "and experience in the manufacture and supply of gas." Are they prepared to show the subordinate Examiners an example of submission to the law, by asking the Board of Trade to remove one of their number in order that their body may be conformed to the Act by the substitution in his place of an independent gas engineer? If not, it is with little grace that Messrs. Tyndall, Pole, and Harcourt appear as trying to impose on others a burden from which they themselves shrink. Let us have obedience to the law by all means; but do not let it be partial.

No Unionists Need Apply!

The notice given by the Directors of the South Metropolitan Gas Company that no member of the Gas Workers' Union will in future be employed by them, is no more than might have been expected. It would have been easy for the word to the same effect to have been passed round among the station managers and foremen; but the Board have taken the more open course of posting their determination for everybody concerned to take note of. The reasons for this policy may be found in what transpired at the recent general meeting of the Company. Mr. G. Livesey then quoted from an utterly superfluous declaration of the General Secretary and prime mover of the Union, which was made public at Plymouth after the confessed failure of the South Metropolitan strike, to the effect that next time a strike was ordered no seven days' notice would be given, and all would go out together. After this, it was only a point of common prudence for any Gas Company who had managed to get rid of the Union to keep clear of it for the future. As we have frequently had occasion to remark, however, there is nothing the Unionists dislike so much as being paid in their own coin. Thus they think themselves perfectly entitled to drive non-Unionists out of employment in works where they have the upper hand, but shriek against the "tyranny" that prefers to keep them at arm's length. As a matter of fact, however, the South Metropolitan notice is not required. All the old stokers who now apply for reinstatement are only too sick of the Union and its leaders. These latter still pretend to have done great things for their supporters; but the Manchester and Salford stokers, who were induced to quit their employment and were then left penniless, and the South Metropolitan strikers who have recently been starving on half-a-crown a week, know what such claims are worth. It is reported that many of the poor fellows who were induced to sacrifice their livelihood to the brazen image of Unionism have been driven by sheer necessity to play the part of "blacklegs" at the Liverpool Docks. It is a sad story throughout; and these sequels to all the mass-meetings and drum-beatings of last December are particularly painful. It will be months yet before the last echoes of the clamour are hushed; and the best that can be hoped for is that gas workmen will be thereby less easy to beguile in the future, when men try to induce them to exchange good living for tawdry processions, and accept windy orations in substitution for wholesome food.

Messrs. J. Wright and Co. have received a first-class award for their patent enamelled steel "Eureka" cooker at the Dunedin (N.Z.) Exhibition.

WATER AND SANITARY AFFAIRS.

It appears that the London County Council are really resolved on introducing a Bill into Parliament, by which a past rateable value of house property, and not that which happens to be current, is to be taken as the basis of the Metropolitan water-rates. The recommendation from the Special Committee on Water Supply and Markets, proposing the introduction of such a Bill, was unanimously adopted at the last meeting of the Council, as moved by Mr. Beal. Some of the statements made in support of the Committee's recommendation are rather hard to understand, though we may suppose they will be implicitly believed by most people who read them. Mr. Beal is reported to have said that the rateable value of London property had increased from 24 to 32 millions sterling during the last five years. In reality, the rateable value is not yet quite 32 millions, but falls short of this amount by about £200,000; and we must look back as far as 1878 to find a value of 24 millions—the interval being thus twelve years instead of five. Mr. Beal may have been mis-reported; but, if so, very few people know it, and public opinion is founded on what appears in print. It would seem by one account that Mr. Beal was speaking of a period during which the increase in the rateable value was simply £3,000,000, in which case there is a comparison between 1883-4 and the present time. Having done our best to set Mr. Beal's figures right, we are confronted with another difficulty; for this gentleman is also reported to have said that the Companies "now charged on £3,000,000 more, "without having expended any more capital." So far is this from being true, that in the four years following 1884 the Companies expended above a million sterling on capital account. If we go back to 1883, a substantial addition may be made to this reckoning. Leaving that out of consideration, we observe that more than a quarter of a million of capital was spent in 1888 alone; and the process is still going on. If, instead of £3,000,000 increase in rateable value, Mr. Beal was really speaking of £8,000,000, which we may conceive to have been possible, covering two quinquennial periods, we are then led to a consideration of the period 1876-86. But in a lesser period than that—namely, between 1880 and 1888—the Companies expended nearly two millions of capital. It is further to be remembered that the account would now be growing more rapidly than it is, if Parliament had not prevented the Grand Junction Company from carrying out their admirable project for establishing an intake 3½ miles above Windsor Bridge. Sir Thomas Farrer, in supporting Mr. Beal's motion, urged that the County Council should make "the loudest protest" they could against the present system, "and cast upon Parliament "the responsibility of not attending to the interests of the "ratepayers of London." We may observe that "consumers" are more numerous than "ratepayers;" and the former have reason to "protest" against the blind rejection of a scheme which, in the opinion of the Metropolitan Water Examiner, might "fairly be regarded as "the initiatory step towards the improvement of the water "supply of all the Thames-deriving Companies, involving the interests of more than 2½ million people." Mr. Beal thinks it is time the Government "did something" in regard to the London Water Supply; and he wishes for a Committee to be appointed to "inquire into "the whole question, with a view to its settlement." We do not know how many "inquiries" we are to have. The Corporation are going to have one, the County Council have provided for another in their Various Powers Bill, and still Mr. Beal is not satisfied. There is to be no peace until the County Council get possession of the water supply; and as yet there are no certain indications that this event will ever come to pass, or that the contentment will be universal when it does.

Coupling the report of the Directors of the East London Water Company with the explanatory remarks offered by the Chairman (Mr. A. W. Gadesden) at the half-yearly meeting held last week, the proprietors of that undertaking may congratulate themselves on the state of their affairs. If one portion of the balance-sheet seemed at first sight rather discouraging, a little further enlightenment as to the facts was sufficient to remove such an impression. Substantial evidence of prosperity presented itself in the maintenance of the dividend at the increased rate of 7½ per cent., reached some little time ago, and in the growth of

unappropriated profits up to £20,863. The existence of this surplus was so strongly felt by some of the shareholders, that they proposed there should be an enlargement of the dividend. Caution, however, dictated compliance with the recommendation of the Directors; and there can be no doubt that the position of the Company will be strengthened by this policy of moderation. It is to be regretted that while the revenue of the half year, compared with the same period in 1888, showed an improvement to the extent of £2895, the increase in the maintenance charges more than absorbed this amount. The cost of management exhibited a decrease, so as to bring down the excess to a sum of £2458; thereby leaving a clear accession of £437. This, taken by itself, would imply very moderate progress; but exceptional causes have been at work to produce the result, and a fair comparison would show a much greater advance. The future, therefore, is bright; and this is better than a brilliant display for the present with very little beyond. Concerning the engineering works, the removal of the principal pumping-station from Old Ford to Lea Bridge is now almost an accomplished fact. The 42-inch main is complete, and has been laid in an admirable manner. The three engines, which collectively are to pump about 45 million gallons of water into the district in 24 hours, are expected by the Engineer (Mr. W. B. Bryan, M. Inst. C.E.) to be fixed and at work by the end of next July. London is so largely dependent on the East London Company for its water supply, that special interest attaches to the efforts which are being made by the Company in order to enlarge the volume of water raised from their wells. The search for water at Waltham Abbey has proved permanently successful; and the supply from the well which has been sunk there is described as most abundant. At Lea Bridge the result is not so good. At Walthamstow the sinking of the well has been delayed by the nature of the ground; but a good supply is confidently anticipated. Mr. Bryan reckons on 10 million gallons per 24 hours from these three wells; and he is not likely to be at fault. This would be about one-fourth the total amount which the Company now have to supply to their consumers. According to General A. de Courcy Scott, it is in the East London district that what may be called the strain upon the water supply is most distinctly felt. Increased resources in this quarter are therefore peculiarly valuable; and it is evident that the Directors, under the guidance of their able Engineer, are resolutely seeking to make their works equal to the utmost demand. The growth of the demand is shown by the amount of extra pumping in the last half year; the excess over the corresponding period in 1888 being nearly equal to 1,700,000 gallons per day. An increase of 4 per cent. in the consumption in the course of a year is no small consideration, and shows the wisdom of the Directors in the policy of extension which they are pursuing. The forward position which the Directors have given to the Company in the matter of the constant supply is also a highly creditable feature.

Mr. W. Woodward, of Bury, who, as already announced in the JOURNAL, has been appointed Engineer and Manager of the Bromley (Kent) Gas Company, has just received from his Committee, through the Town Clerk, a gratifying communication, in the form of a copy of a resolution expressive of their high appreciation of his services, and of the many improvements initiated by him during his tenure of the office of Gas Engineer of the Corporation.

The London County Council and Subways.—At the meeting of the London County Council last Tuesday, it was decided not to proceed this session with the portion of their Subways and Overhead Wires Bill specially bearing upon new subways. It may be remembered that 37 petitions were presented against this part of the Bill by gas, water, electric light, and other companies; and in view of this, the Parliamentary and Highways Committee of the Council instructed Mr. Wolfe Barry, C.E., and Mr. Cripps (their Parliamentary Agent) to enter into negotiations with the various opponents, in order to ascertain how far the objections expressed in the petitions might be met by modifications of the Bill. But, at a meeting with the Solicitor, Agent, and Engineers acting for the associated Water Companies, these gentlemen declined even to enter into discussion on any of the details of the Bill, on the ground that the measure is wholly objectionable, and that to discuss its details might have the appearance of accepting its principle. In reporting on this matter to the Council, the Committee said much valuable information had been elicited upon the subject, which might enable the Council to deal with it more satisfactorily in a future session, after more mature consideration.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 661.)

THE past week, or what fragment of it could be spared from holiday making for the purposes of business, was naturally very tame. There was more done in closing accounts than in opening new ones; and all markets were quiet, and some were a little flat. Still there is a pretty general anticipation that with the resumption of the normal number of working days will come a revival of enterprise and a demand for investments. The Gas Market would seem rather to have anticipated this movement; for it has shown considerable activity for the time of year, with good general firmness. Many issues have advanced in value, some of them materially; while not any quotation has receded. Gaslight "A" shows out 3 better; but the prices at which business has been marked throughout the week are not very far apart—ranging from 250½ to 252. The "H" has made a proportionate advance of 1. Small business was done in that issue, and in some 10 per cent. preference, at good figures. Nothing at all was marked in South Metropolitans; but all three issues are quoted 5 higher at the same wide margins as before. A single transaction in Commercial old and one in the debenture are all the record for the week. The Company had a highly satisfactory general meeting on Thursday, under the presidency of the new Chairman (Mr. J. Blacket Gill) whose very able and judicious speech created a most favourable impression. Needless to say, the substantial dividend which had been fairly earned was declared. A few transactions have been effected in the shares of some of the Suburban and Provincial undertakings; but beyond showing that they are all firm, they offer no particular feature for comment. Several of the foreign Companies have advanced in quotations. Imperial Continental was active and in good demand; finishing on Thursday at the figure of 222, with an improvement of 2 in the quotation. European and Continental Union are also higher. Water stocks have again been irregular. East London and New River are stronger; but Grand Junction has had a further relapse.

The daily operations were: Monday's Gas business was mostly in Gaslight "A" and Imperial Continental, which were very firm, but did not advance. Europeans rose ½ to 1. Imperial Continental again had the lion's share of the business on Tuesday, and improved 1. Gaslight "A" did the like; while several other issues marked top price. Water was more active and firmer. New River rose 2. Business in Gas continued very brisk on Wednesday, and with unabated firmness. All the South Metropolitans improved 5; Commercial old, 2; and Gaslight "A" and "H," 1 each. Water was quiet. Business fell off materially on Thursday; but prices were better than ever. Gaslight "A" made a further advance of 1. In Water, East London advanced 1; but Grand Junction receded 1½.

ELECTRIC LIGHTING MEMORANDA.

The Meeting of the London Electric Supply Corporation—European and American Practice in Electrical Engineering—Electric Lighting in Birmingham—The Risks of High-Potential Currents.

NOTHING of any particular moment was done at the meeting of the London Electric Supply Corporation, whose accounts were commented upon in this column last week. Mr. J. Staats-Forbes presided, and made a very good story for the proprietors out of the material which we dealt with rather differently in our last issue. The Chairman was specially careful not to say too much in praise either of the work hitherto done by the Company, or of their prospects. In comparison with what has been said on similar occasions by the heads of electric lighting concerns, Mr. Forbes was remarkably modest. He was, however, thoroughly businesslike. The tenour of his speech in moving the adoption of the report and accounts was simply that the Directors had spent a great deal of the shareholders' money without having much to show for it as yet; but it was hoped that they had adopted the best policy in preparation for the working future that might await the concern. It was the best that could be said under the circumstances; and the Chairman is undoubtedly wise in pitching his official utterances in a low key. There has already been far too much prophesying and too little performance on the part of electrical speculators, and the public will think none the worse of the prospects of Mr. Forbes's Company for the refusal of the new Chairman to deal in hyperbole before he can show much profit for the shareholders.

In a recent issue of *Industries*, a lament is made on the slow progress of electric lighting in England; and the remark is once more ventured that if the electrical business here was carried out more on American lines, some of the branches of the industry would be farther forward than they are. This is the old question-begging way of arguing the point, to which exception has been taken for years in various ways that may be summed up in the statement that America is not England. What suits raw townships in the United States will not go down here; and the recent experience of New York goes to show that, in the long run, it would be better for electricians if

American town authorities were a little more particular in regard to electrical matters. The crude fact that the first comers in the new business of electric lighting, electric traction, and other branches of electrical industry have been allowed to do as they pleased in the young towns of the States, is no evidence that the much-abused word "progress" can really be more fittingly applied to American than to European electrical enterprise. There multiplication goes for nothing in scientific stock taking. The writer in *Industries* greatly admires the American plan of multiplying electrical machinery from set patterns, which makes distinct installations come much cheaper than when they are separately designed; but it may be urged, in reply, that the premature adoption of set types does not favour scientific progress, although it may facilitate speculation. This American craze for standardizing everything, although admirably qualified for satisfying the commercial requirements of a large territory, may more easily become the means of imposing bad patterns upon purchasers than of assisting in the development of improvements. In a general way, it by no means appears that American practice in electrical engineering is so superior to European that any one need fall down and worship it.

The Birmingham Corporation have decided to encourage the local Electric Light Company by giving them the lighting of the Victoria Courts, for which provision is to be made at a cost of £2000, which will include gas-fittings to serve as a stand-by, in case the electric lamps should play such vagaries while the Judges are sitting as those of Leeds did, to the huge amusement of the spectators, during the Lever trial. The recommendation to hand over the Birmingham Courts to a possibly similar fate was not allowed to pass unchallenged. Several members of the Town Council urged the prior claims of the Gas Committee to be allowed to show what they could do with the Courts; but the desire was overruled—probably, as it appears, because it was felt that if the Committee once got hold of the job the electricians would not have the least chance of justifying their existence in the town. It was understood that the expense of lighting the Courts, after the fittings had been paid for, would be thrice as much for electric lamps as for gas; and the successful manner in which gas lighting and ventilation have been combined in other work done by the Gas Committee for the town was admitted; but in the end the fascinating though vague notion of the electric lamps being more "scientific," more fashionable, or more modern than gas, carried the day. This little order will neither make the Birmingham Electric Light Company, nor spoil the Gas Committee. The willingness of the Corporation to spend more money on the job than their own Committee could do it for, is a testimony to their public spirit; and it is to be hoped they will be satisfied with the result achieved.

Although the extent to which electricity is distributed in Paris by means of underground wires is small, trouble has already been experienced on this account. It is well known that the main sewers of Paris are much larger than is required for their original and primary purpose, and that they are accordingly utilized for conduits conveying gas, compressed air, water, telegraph and telephone wires, and other pipes and cables, including latterly high-tension electric light cables. For the past fifteen months, during which the last-named order of cables have been admitted into the sewers, there has been a succession of fires and explosions—small and insignificant taken separately, but amounting to considerable damage when summed up. The most serious of these "accidents" occurred the other day in the Boulevard des Italiens, when a leaden gas service was first melted and the escaping gas ignited. A window was shattered in the street overhead. The Gas Company preserve a calm attitude with regard to these incidents, presumably for the reason that they were in possession of the ground before the electricians came, and that accordingly the latter must be held to be intruders. The point appears to be that sooner or later local authorities will have to make up their minds what to do with lighting systems entailing the use of these unmanageable high-pressure currents. From far Monte Video complaints of their dangerous character when strung overhead are sent to us; and even putting them underground, as in Paris, does not render them innocuous. It is beginning to look as if Mr. Edison's advice must be followed, and such currents be altogether prohibited by law.

Mr. C. Armitage, Gas Engineer of the Lancaster Corporation, has been elected an associate member of the Institution of Civil Engineers.

Business Transfer.—Messrs. W. Parkinson and Co. have purchased the old-established business of Messrs. John Bent and Son, gas meter and lamp manufacturers, of Bell Barn Road, Birmingham. After 40 years of business life, Mr. Bent seeks retirement; but we understand that the existing staff will be retained, and the business carried on as heretofore.

Mr. W. H. Radford, C.E., of Nottingham, has been appointed representative and consulting engineer in England for the Corporation of Durban, in South Africa. He will act conjointly with the London agents in ordering and testing the materials required for the water-works extension. It is computed that the cost of the new works, when finally completed, will be about £120,000.

A FRENCH TREATISE ON COAL GAS.*

At last we have the pleasure of welcoming a French technical treatise on the manufacture of coal gas. Active as is the industry of gas supply in France, and intelligent as are the many trained engineers connected with it, an original French technical manual on the subject of gas supply, setting forth French theory and practice, has been lacking. The nearest thing to this *desideratum* has been the excellent translation of the work of Dr. Schilling by M. Ed. Servier; but this work was, of course, no more French than was Clegg's book, previously translated by the same Engineer. M. Servier did his best to add some independent value to his translation of the German book by including a chapter dealing with the results of M. Arson's experiments on the flow of gas through pipes. This appendix did not, however, alter the complexion of the chief matter of the book; and, consequently, until the present time a student desiring to understand in what respects, if any, French gas engineering differs from English or German practice, has had no guide for his inquiries beyond the Transactions of the Société Technique, and the rare occasional technical articles of the French gas journals. M. Borias has therefore had the opportunity of satisfying a void in the serious literature of his nation; and his work is accordingly assured of that favourable reception which goes such a very long way towards an ultimate success. It remains for the critical reader to see whether the author has made a satisfactory use of his chance, and produced a book worthy of being regarded and quoted from as a standard description of French gas engineering. M. Borias claims our respect by his credentials as Engineer of the Carcassonne Gas Company, the holder of a diploma as Engineer of "Arts et Manufactures," and pupil of M. Letreust, President of the Société Technique du Gaz en France. He should therefore be fully qualified to report upon the technical side of the French gas industry.

The first part of the book is devoted to tables, memoranda, and formulæ. Mathematical, arithmetrical, geometrical, and other data of pure and applied science which may be useful to an engineer, are given here to the length of 84 pages. The collection is apparently made with great care, with a view to providing the gas engineer with all that he may require for rubbing up the science which he may be supposed to have acquired during his student days, and which is so apt to grow rusty in after years. M. Borias is to be congratulated on the strictness with which he has kept practical requirements in his mind while making his selections from the data of science. This part of his work at least compares favourably with the similar chapters of engineering text-books in any language.

The second part of the book deals with "Gas Manufacture," strictly so called. Its first chapter gives what the author calls a succinct history of the discovery of gas lighting; and a rather amusing story it is, as told by a French engineer by the aid of French printers. As the history is extremely brief, we translate it in full, preserving the spelling of the English proper names:—

> The earliest known experiments with illuminating gas drawn from coal were made by Sir Hales in 1669, and recommenced by Watson in 1769. The results were insignificant, and they remained forgotten until the day when Murdoch, in England (1792) and Ph. Lebon in France, about the same epoch, endeavoured to apply gas lighting for the use of inhabited places. To Lebon belongs the glory of the first practical attempts and the merit of having stated the theory of this invention, and determined its true field from the beginning. Murdoch and Winsor set themselves to popularize gas lighting. The latter struggled against the prejudices which hung around this novelty in England and on the Continent, and founded the first Gas Company under the name of the Winsor, Accam, and Hargreaves Company. At length Samuel Cleeg appeared; and it may be said that from his day the new industry quitted its infancy. He endowed it with new apparatus and methods one after another; he perfected those already existing, and simplified the process of manufacture. At his death an immensity of roadway had been traversed, and his successors were only left with the duty of prosecuting the work so gloriously advanced, and assuring its future.

After his short *excursus* into history, M. Borias proceeds to treat of mineral fuels generally, and especially of coal, from the point of view of the gas maker, with due reference to French requirements and resources. He tells us that the output of French coal amounts to 19 million tonnes yearly, one-sixth of which is used for gas making. He thinks the store of coal in Europe is equal to all demands for a period of 25,000 years. He classes gas coals in five "types," according to their chemical composition, and gives hints for the choice of coals by gas managers with reference to technical and commercial considerations. In all this the author is commendably fresh, authoritative, modern, and mindful of his readers' real requirements. He is writing for French carbonizers, and never wanders from the point. When treating of retorts and settings, M. Borias, in his desire to be methodical, endeavours to set up a new system of classification, based on the consideration of the fuel employed for heating being solid, liquid, or gaseous. Seeing how often a setting of retorts must, in practice, be convertible to burn tar instead of coke, in both simple and generator furnaces, it appears to us that this classification is not justified; it is quite enough to lead a student to properly discriminate between gas generator and direct-acting furnaces. In dealing with the design of retort-settings, M. Borias is practical, though his descriptions suffer greatly from absence of diagrams. The book is not illustrated at all, which is a sad drawback to its utility, as in many instances it must be difficult for anyone unable to form mental

* "Traité de la Fabrication du Gaz." Par Edmond Borias, Ingénieur des Arts et Manufactures, Directeur d'Usines à Gaz. Paris: Baudry et Cie.; 1890.

images of the kind of apparatus in question to perceive what the author is talking about. Thus, in the paragraph in which he recommends that retorts should be set at distances from each other and from the arch or piers of not more than 15 or less than 10 centimetres, comprehension of his meaning by students would be much assisted by reference to a drawing, which, however, is not given. The practical gas manager speaks in many other of M. Borias's remarks, not all of which are likely to be generally endorsed, but which are all worthy of respect. It is stated that the Paris Gas Company make great use of briquettes (composed of coal, coke dust, and pitch) for heating retorts; a test of this fuel showed a consumption of 245 kilos. per tonne of coal carbonized. M. Borias describes various types of retort furnaces as well as can be done without figures; and then gives a theoretical chapter which appears to exhaust the subject. For his purposes, the author makes great use of the multitudinous reports on technical subjects of the Engineers of the Paris Gas Company. It is to be understood, of course, that this book is not a critical examination of gas engineering so much as a presentment of French views and practice. It is often made a reproach to French technical writers that they pay no attention to what is done outside their own country; but M. Borias's limitation in the same way is not to be magnified into a fault, because his object, as we take it, is rather to present a *corpus* of French doctrine and practice in gas making than to criticize it with reference to foreign examples. Besides, the majority of his readers are more likely to want to know the best French practice, than to learn what is done in countries where they are not likely to seek employment. Indeed, when he has to look for the work of Mr. Lewis Thompson Wright under the terrifying *alias* "M. Wrigth," an English engineer is constrained to hope that M. Borias will confine himself to native authorities. It is as a compendium of French knowledge of the subject that this work must be studied; and, judged by this standard, it is entitled to rank very high.

Engineers accustomed to the practice of the best English gas-works will note in M. Borias's work a curious poverty of description of apparatus, arguing great simplicity of design of plant, while the author is fearfully and wonderfully learned in the chemistry and physics of his art. This lack of connection between knowledge and practice in the case of French gas engineers has often been remarked by foreign critics. An English gas engineer in charge of a good-sized works may not be half as deeply instructed as his French compeer in some matters that it would be well for him to know; but the probability is that the works of the former will be vastly better equipped than those of the latter for making good gas at the minimum of expense. Which school has most to learn from the other is not for us to say. Certainly, a better mutual acquaintance ought to be beneficial to both.

M. Borias describes the condensation, washing, and purification of gas, in connection with which it may be remarked that he does not mention the system of continuous revivification by the use of air; to say nothing of the oxygen process. He admits, however, that the necessities of sulphur purification do not weigh upon the French gas manager as on his English brother. Exhaustion, gasholder construction, and gas distribution receive a due share of the author's attention. He shakes himself so far free from the traditions of the Paris Gas Company as to recommend telescopic gasholders; but evidently he has no idea that the multiplication of lifts can be carried further with advantage, to say nothing of the possibility of diminishing or wholly abolishing lofty guide-framing, as recently practised in England. Gas-burners, ventilation, photometry, the use of gas for motive power, &c., the utilization of the residual products of gas manufacture—all have separate chapters devoted to them; and throughout the author's desire to be explicit and practical is conspicuous.

The volume contains 465 pages of matter, besides a good index and table of contents. It is well printed in legible type, and serviceably bound in cloth. Altogether, it is a highly creditable production; and if it had only been illustrated, it would have left nothing to be desired of a Treatise on Gas Engineering as understood and practised in France. The lack of drawings to accompany the author's descriptions is, however, an unpardonable omission. It is impossible for a reader to imagine what the various kinds of apparatus mentioned are really like; and, moreover, such fundamental conceptions of gas engineering as are involved in the laying out of a gas manufacturing station are ignored by an author when he attempts to do without drawings. This book would lead a student to think that French gas manufacture and distribution have a great deal to do with mathematics and chemistry, and somewhat less with engineering construction; while all such considerations as making provision for the transport of heavy materials, the proportioning of plant to get the greatest production from a given amount of capital, providing for extensions, &c., would escape notice. Yet every technician knows that these latter points are of the essence of gas engineering, in the proper sense of the term. In effect, while M. Borias has succeeded in telling, with praiseworthy exactitude, what French gas managers *know*, he has left us completely in the dark respecting what they *do*. Perhaps in a second edition, enlarged for the purpose, the author may be able to supply the wherewithal for enabling a student to ascertain how French engineers apply the learning so richly stored in this volume of unrelieved letterpress.

NOTES.

A Pressure Gas Battery.

An attempt has been made by Mr. Paul Scharf to solve the difficulty of obtaining electricity direct from gases. Mr. Scharf's gas battery is patented in the United States. It consists of a gas-tight vessel, preferably of cylindrical form, capable of holding the gases under very considerable pressure. Many earlier attempts have been made in the same direction, but without success. The idea is to work with two gases in pairs, or with one gas and a liquid—one gas or liquid forming the positive, and the other the negative element in the cell. Among the gases of one class named by Mr. Scharf as suitable for his purpose are hydrogen, water gas, generator gas, coal gas, and all the vapours of the more or less volatile hydrocarbons of mineral oil. In the other class are placed air, oxygen, chlorine, fluorine, and the liquids hydrogen peroxide and nitric acid. Two typical gases for use in this way would be coal gas and oxygen, which would be compressed and stored separately. Each gas is then admitted to one side of a carbon diaphragm, or rather between two adjacent carbon diaphragms, contained in the vessel already described; and the plates of carbon are separated into pairs by alternate spaces filled with a gas and with asbestos saturated with acidulated water. All the intervals of even numbers in the pile would thus contain one gas; and all the others another of opposite electrical condition. In this way a pile of any number of cells might be built up; and as all the plates of similar electrical sign would be connected, the power of the battery would depend upon the number of cells in use, and the activity of the action between the opposed gases. Unfortunately, Mr. Scharf does not state the power of this arrangement, or the duty obtainable from it as compared with the effect produced by the chemical combination of the same elements in the ordinary way of combustion.

The Cause of Coking in Coal.

It may sound scarcely credible to some students of pyrology and gas technics, but it is nevertheless true, that the physical cause of the caking or fusing of bituminous coal into the form of coke, under a distilling heat, is by no means understood. By some German chemists an attempt has been made to connect the physical phenomenon of coking with the chemical composition of the coal, especially with reference to the richness of the coal in what is called disposable hydrogen, or that proportion of it which is in excess of the quantity required to form water with the oxygen present. Unfortunately for the general acceptation of this standard for the coking quality in coal, it does not correspond with observed results. Neither does the richness of a sample of coke in carbon determine its coking capabilities; for two specimens of coal of practically identical carbon composition will often be found to behave very differently in the retort or coke oven. If the property of coking does not reside either in the surplus hydrogen or the fixed carbon, it is certainly not to be found in the content of the coal in oxygen, which gives no indication whatever of the physical behaviour of the coal under heat. Some coking coals coke without much swelling; others swell considerably in the process of coking. In either case, the coal must undergo a stage of fusion, in which it becomes a thick, semi-fluid mass through which the gas escapes. Why one kind of coal should swell considerably while another variety, of similar composition, does not, is a problem not apparently capable of solution from any of the chemical data usually preserved in analyses of coals.

Sinking Sump-Holes by Live Steam.

A report upon the Wagner method of sinking wells by means of live steam has been made by Assistant-Quartermaster Pond, of the United States Army, to the Quartermaster-General's Department. The *modus operandi* is described as most interesting, and as promising to be of great value in making different kinds of excavations. The first step is to bore a hole in the ordinary way to a depth of (say) 20 feet. In this bore-hole is then inserted a heavy galvanized wrought-iron 6-inch pipe; its lower end being perforated for a length of 6 feet with a number of ¾-inch holes. Inside this pipe is lowered a 2-inch steam-pipe, having a nozzle at the bottom end, and connected with a boiler containing steam at 150 lbs. pressure. When the steam is first turned on, a continuous stream of sand, stones, soil, and steam rises out of the 6-inch pipe; and the pipe itself rapidly descends into the earth—being constantly turned by a man holding the upper end with a pair of heavy pipe-tongs. Extra lengths are added to the pipe as required; the operation of sinking being continuous until a copious supply of ground water is struck. Then the arrangement becomes an artificial geyser. Under the action of the steam, a column of water rises into the air to a considerable height, carrying with it stones, &c. This phenomenon is repeated intermittently as the cold water condenses the steam, and is again expelled by the pressure. The steam escapes into the ground below the pipe and through the perforations; clearing out everything for a diameter of 8 feet. In this way caverns of considerable size can be made at any depth from which water is to be drained; and thus sump-holes may be put down quickly and easily without excavating all the way from the surface. The drainage through a subterranean water-bearing stratum into these steamed wells is reported to be very perfect, as the gravel is effectually cleaned, and there is nothing left to impede the flow of the water.

COMMUNICATED ARTICLE.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXXIX.

In 1884, Dr. H. E. Armstrong communicated to the Society of Chemical Industry the results of some researches conducted by him in connection with oil-gas manufacture.* In the compression of oil gas prepared by the Pintsch process, a quantity of hydrocarbon liquid is deposited, and a further deposition takes place in the reservoirs. He found that this liquid was practically free from paraffins. It consisted essentially of benzene and toluene, mixed with hydrocarbons of the olefine and acetylene series. The reservoir hydrocarbon, especially, was saturated with gas; and from this gas a substance identical with crotonylene was obtained. Normal amylene and normal hexylene were also present in the liquid. Benzene and amylene appeared to be the chief constituents; and though the composition was subject to considerable variation, it was rare to find less than 50 per cent. of benzene and toluene. The hydrocarbon from the pumps differed from that deposited in the reservoirs only by being richer in the less volatile hydrocarbons. The liquid was so far saturated with gases and matters volatile at too low temperatures to be of any use in the arts, that Dr. Armstrong recommended their recovery and return to the gas, by a partial preliminary distillation of the liquid before disposal.

Some specimens of tar from the oil-gas works contained practically nothing that would volatilize in steam, and appeared to be all but free from benzene, naphthalene, and anthracene. They consisted almost entirely of undecomposed petroleum hydrocarbons. Others were somewhat richer in volatile matters, and contained appreciable quantities of benzene and naphthalene. The differences may be due to the employment of higher heats. The average tar from another works yielded 20 per cent. of steam distillate. But more than half of this consisted of olefines, and the remainder was composed mainly of toluene and other benzenes and naphthalene. Thin tar from the washer yielded upwards of 50 per cent. of steam distillate, of which about 30 per cent. consisted of olefines and the remainder of benzenes and naphthalenes.

Dr. Armstrong considered that, excluding from consideration the phenols and basic compounds which were contained in ordinary tars, the character of the hydrocarbons produced depends far less upon the character of the material used than upon the temperature. Messrs. Thorpe and Young have shown that when solid paraffin is subjected to a moderate heat under a pressure of 20 to 25 lbs., it is resolved into a mixture of lower paraffins and olefines; and in the oil-gas process this reaction appears to go so far as the almost complete destruction of the paraffins, with the formation of benzenes and naphthalenes as well as acetylenes. In the course of a discussion that followed the reading of the paper, Dr. Percy F. Frankland stated that some years ago he examined a gas produced from oil by a patent process, and found that it contained a large proportion of paraffin hydrocarbons. Speaking from memory, they amounted to from 12 to 20 per cent. The presence of these paraffins, though apparently contrary to Dr. Armstrong's results, was probably due to the use of lower temperatures of distillation. The retorts were kept at a cherry-red heat, while in the Pintsch and other processes they were nearer a bright orange; and it was probable that at such high temperatures the gaseous paraffins were converted into hydrocarbons of the benzene series.

In a communication to the Chemical Society, relating to the same experiments,† Dr. Armstrong stated that the olefines present in the compressed oil gas, as ascertained by scrubbing with bromine, were chiefly ethylene and crotonylene. Butylene and propylene were also found; but no acetylene. The liquid condensing in the pumps contained normal amylene, hexylene, and heptolene, and was saturated with crotonylene. It also contained considerable quantities of the next homologue (C_5H_8). It was rich in benzene and toluene; but contained only traces of higher benzenes. The steam distillate from the tar was rich in members of the acetylene series, such as Schorlemmer discovered in the light oils from cannel and Boghead coal. The oil-gas tar also contained one, and probably two, of the higher members of the benzene series, and a very considerable quantity of naphthalene. A small quantity of olefines, such as form the chief constituents of Russian petroleum, were likewise found in the tar.

M. St. Claire Deville has given the following particulars of the heavy oil distilled from tar by the Paris Gas Company‡. The colour is dark brown, and the specific gravity at 32° is 1044, which decreases to 1007 when the temperature is raised to 88°. About 11 gallons of it go to 1 cwt. Heated to 302° Fahr. it merely loses a little moisture; and at 424° the loss is 12·5 per cent. It does not freeze at 12°; and a lighted torch plunged into it is immediately extinguished. The composition is: Carbon, 82 per cent.; hydrogen, 7·6 per cent.; and 10·4 per cent. of oxygen, with nitrogen and sulphur. He also examined twelve different samples of crude mineral oils. The composition varied between 82 to 87·1 per cent. of carbon, 7·6 to 14·8 of hydrogen, and 0·9 to 10·4 of oxygen, &c. The specific gravities ranged from 0·786 to 1·044. One of the samples consisted of crude petroleum from Pennsylvania. It lost 4·3 per cent. at 212°, 33·3 per cent. at 284°, and 38·7 per cent. at 356°. The Parma oil was the lightest tested; and the loss at the three temperatures just named was 1·1, 33·3, and 60·5 per cent. respectively. The Allegheny oil lost scarcely anything at 266°, and only 12 per cent. at 356°.

Professor Chandler, reporting to the Board of Health at New York in 1870, stated that the crude petroleum as it comes from the wells in Pennsylvania is a dark greenish-brown liquid with an offensive odour, varying in specific gravity from ·782 to ·820. The average composition is 85 per cent. of carbon and 15 per cent. of hydrogen; but it consists of a mixture comprising a large number of hydrocarbons, the lighter of which generally belong to the "marsh gas," and the heavier to the "olefine" series. The volatility of the various constituents is intimately connected with the specific gravity; the lighter liquids boiling at lower, and the heavier at higher temperatures. Some are so volatile as to evaporate very rapidly indeed at ordinary temperatures—rendering it dangerous to approach an open tank with a flame; while others require a temperature of 700° to 800° to volatilize them. It usually comes from Devonian rocks, which are much older than the carboniferous or coal measures, and consists chiefly of hydrocarbons belonging to the marsh gas or paraffin series. The oils of Italy do not contain any of the lighter members of this series, as they have already evaporated; but in Pennsylvania the rocks are impervious, and so evaporation is impossible. The olefines, which are distinguishable from the paraffins by the fact that they are attacked by sulphuric acid and converted into alcohol, are not present to any great extent in American petroleum. The benzene or aromatic series are not found in it, except in traces, though they are present in Rangoon tar. The petroleum is refined by fractional distillation, and by treatment with sulphuric acid to remove colouring matter and gummy substances, the excess of acid washed out with soda.

Mr. S. Dana Hayes, in an interesting communication to the *American Journal of Science and Art*, throws some valuable light on the properties of light hydrocarbon fluids.* He says that the term "naphtha," as applied to some of the distillates obtained from petroleum, includes liquids having a specific gravity not exceeding ·742, and boiling-points (varying according to the densities) ranging from 65° to 300°. A noticeable characteristic of the naphthas is the absence of oily bodies; they do not leave any permanent stain on paper dipped into them, as do all the heavier and oily distillates obtained from petroleum. The redistillation of these naphthas under different conditions produces other hydrocarbons, some of which are oils that will stain paper like fats; and crystallizable paraffin may be obtained by properly conducted distillation. In 1861, Mr. Hayes had occasion to redistil several thousand tons of light petroleum naphtha which was entirely free from oily bodies. He used cast-iron stills, heated directly by coal fires, and furnished with powerful condensers; and he found that, besides the gases, light vapours, and a greatly diminished volume of naphtha, an unexpectedly large proportion of heavy paraffin oils was obtained. After the distillations were finished, large masses of separated carbon were found in the stills, as in the ordinary destructive distillation of crude petroleum or of its heavy products. In 1862, Professor Bacon observed that a sample of keroseline—a light naphtha having a specific gravity of ·640 at 72°, and readily and completely volatilizable at ordinary temperatures—would begin to boil at 85°; but the temperature gradually rose as the more volatile parts passed off. At 170° three-quarters of the liquid had evaporated; but it continued to boil freely, and the whole was not converted into vapour until the thermometer had risen considerably above 300°. An important point thus brought out is that, when evaporating solutions of various substances that have been dissolved in light hydrocarbons, it is preferable to allow the evaporation to proceed at ordinary temperatures than to employ heat.

Mr. Hayes had examined several samples of oils produced from naphthas in Willard's apparatus, which consisted of three or more wrought-iron cylinders, having a capacity of several hundred gallons each, connected together after the manner of Woulfe's bottles, and the first in the series being joined up to a steam-boiler. Each vessel was half filled with petroleum naphtha of the lightest and cheapest kind; and steam, at a pressure of 50 lbs., was passed through the series—bubbling up through and vaporizing the naphtha. The steam and vapours were held together in the upper part of the vessels at a temperature rather over 212°, which was considerably above the boiling-point of the naphtha. Any uncondensable gases and vapours passed onwards, whilst condensable matters returned to the liquid. The apparatus was operated continuously by pumping in fresh supplies of naphtha when necessary; and the heavy oil was drawn off from the bottom of each vessel at intervals; the largest quantity being found in the first cylinder. The longer the vapours were held in the cylinder, the greater was the yield of heavy oil, which ranged from 2 to 10 per cent. The heavy oil is a dark yellowish brown liquid, retaining when fresh an odour of naphtha, which passes off

* See JOURNAL, Vol. XLIV., pp. 716, 762, 808.
† *Ibid.*, Vol. XLV., p. 1209. ‡ *Ibid.*, Vol. XIX., p. 45.

* See JOURNAL, Vol. XX., p. 813.

after exposure to the air for a few days. The specific gravity varies from ·850 to ·860; and the boiling point is above 400° Fahr. It is essentially a paraffin oil, like that of the same density obtained directly from petroleum. It does not evaporate at atmospheric temperatures, leaves a permanent greasy stain on paper, and is a good lubricator for machinery; and when redistilled at high temperatures, it breaks up into lighter and heavier liquid hydrocarbons, paraffin, and separated carbon. So Mr. Willard's apparatus shows that petroleum naphthas, and probably those from coal or other sources also, may be decomposed at a temperature below 300° into lighter and heavier hydrocarbons; the latter being paraffin oils belonging to a class of hydrocarbons different from those of the original naphtha.

Some researches conducted by Professor Silliman are quoted in further illustration of this reaction. He found that the products obtained from petroleum are not merely bodies previously existing in it, but are new substances formed by heat and distillation. Illuminating oils, obtained by distillation at a temperature above 500°, were exposed to the air for many days, at a temperature below 212°. Six or eight fluid ounces, exposed for six weeks or more, gradually and slowly diminished; finally leaving a residue of dark brown lustrous rosin or pitch, which was hard and brittle in the cold.

The question of the freedom of petroleum and oils from sulphur is a matter of great importance, especially in view of the fact that these fluids are freely recommended to the consideration of gas engineers who are working under the sulphur clauses. It has hitherto been the custom with manufacturers of oil gas, to claim that their product is greatly superior, in matter of purity, to ordinary coal gas; and especially that it is absolutely free from sulphur in all forms. A well-known gas engineer, having occasion to examine some gas made from oil, and supplied to a small village, reported the presence of sulphuretted hydrogen in it, and was at once held up to ridicule, by those interested in the process, as having asserted an impossibility. The careful experiments of Mr. A. Bell, however, as communicated to the North British Association of Gas Managers,* show that sulphur is present both in paraffin oils as distilled from shale, &c., and in many varieties of mineral oils; and that not only in the form of sulphuretted hydrogen, which is readily removable, but also as those mysterious "sulphur compounds" which hitherto have baffled the efforts of chemists in the way of completely removing them from coal gas. In the absence of special precautions in regard to the kind of oil used—precautions that would be impracticable on a commercial scale on the ground of expense—it is impossible to guarantee that oil gas should be purer than, or even as pure as, coal gas. Mr. Bell was passing ordinary coal gas through a purifier containing sawdust saturated with paraffin spirit, recovered from the waste gases produced during the distillation of shale, in the hope of thus reducing the sulphur compounds. But he found that, instead of being reduced, they were increased threefold. In consequence of this unexpected result, he obtained a number of representative samples of paraffin and petroleum oils, and adapted them to the Referees' sulphur test. He thus proved conclusively not only that they contain sulphur compounds, but that when compared light for light with coal gas, they give off during combustion a larger proportion of sulphur. This proves the absurdity of seeking to guard against the so-called effects of sulphur in the gas by substituting oil-lamps for gas-burners. Mr. Bell gives tests of 12 samples of paraffin oil, which contained sulphur equivalent to from 11 to 35 grains per 100 cubic feet of gas, and three tests of petroleum, two of which contained very little, whilst the third contained the equivalent of 36·8 grains of sulphur per 100 cubic feet of gas.

Steel-Melting by Water Gas.—Under the auspices of the British Water Gas Syndicate, Limited, experiments in steel-melting by water gas were recently conducted at the Leeds Forge, in the presence of a number of gentlemen interested in the matter. The object of the experiment was to prove the utility in the way of economy of time required to melt an ordinary charge of pig iron into Siemens steel by means of water gas mixed with producer gas, as against the older practice of using merely producer or Siemens gas; and also in the economy of fuel required for the purpose. It was stated that, under the old-fashioned system, the Leeds Forge had only been able by one furnace to produce from nine to eleven charges per week, with a consumption of fuel of about 10 cwt. to the ton of ingots produced. Experiments had been going on for some time; and it was said that, on the day before the experiments took place, work was conducted at a speed of from 20 to 22 charges per week, with a consumption of less than 5 cwt. of fuel per ton of ingots produced. Those present at the experiment were afforded every opportunity for obtaining samples of the gases going into and issuing from the furnace, of the materials used in the charge, and of the charge at the various periods of its conversion into steel; so that by analysis they might be able to form their independent judgment as to the improved action which takes place under the influence of water gas. The charge, consisting of 9 tons 6 cwt., was completely converted into mild steel within the space of 5 hours 4 min.; and when tapped, it is stated that it appeared to be in a more fluid and better condition than that usually obtained by means of ordinary producer gas.

* See JOURNAL, Vol. LIV., p. 403.

TECHNICAL RECORD.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The Half-Yearly Meeting at Swindon.

(*Concluded from p.* 590.)

After the proceedings reported last week, Mr. F. G. DEXTER (Wantage) read a paper entitled—

A METHOD OF INCREASING THE CONSUMPTION OF GAS FOR COOKING AND HEATING PURPOSES.

It seems to be the orthodox rule in assemblies of this kind for the author of a paper or address to occupy the first five minutes or so in lamenting his inability to properly perform the task in hand, and calling the attention of the meeting to the fact. I believe that the final impression of this kind of thing is that the author himself would be about the last individual to sincerely believe it. At any rate, if he failed to demonstrate forthwith the diametrically opposite fact, his audience might be safely left to arrive at that conclusion in a much shorter space of time; for the fact remains that the aforesaid five minutes are generally more profitably spent by the members in arranging chairs, making a liberal use of the pocket-handkerchief, and a few other kindred attentions. As a new member of the Association, I am particularly conscious of the honour conferred upon me in the invitation to present a paper. Without apology, therefore, I give you—not a theory or proposition, but the actual results brought about by the adoption of a scheme (hitherto untried, I believe) to effect the subject of this paper.

On taking charge of the Wantage Gas-Works last August twelvemonth, I found a state of things calculated to gladden the heart of any manager. To enumerate the difficulties encountered would afford scope for a lengthy paper in itself; and therefore I will content myself with briefly mentioning those bearing more immediately on the subject in hand. The annual output was about 8 million cubic feet, with a leakage of 20 per cent. The mains and services were allowed to look after themselves, until their existence was demonstrated in a more or less unpleasant manner. No record had been kept either of the position or the age of the mains and services, whether forming part of the works or of the distributing system. The ideal depth seemed to be 6 inches, with two large firms manufacturing traction and semi-portable engines wholesale, with free licence to turn the "kittens" into the streets at will. All stores were purchased (I might have said "obtained," but I can guarantee that they were paid for) from local tradesmen, who were also entrusted with the required repairs at the works, as well as all meter fixing and service and main laying. Under these circumstances, my first winter's experiences were particularly agreeable. Complaints from consumers were rife on all sides, from defective mains, services, and interior fittings, although, of course, "the gas" was the scapegoat; and as this was sent out well purified, and of 17-candle average quality, it was rather hard to bear without the means of putting the actual defects right, except at great expense with insufficient workmen, and only at such times as might suit their employers' purposes.

By the close of October I had had enough, and at the next Board meeting (on Nov. 5), I introduced a report condemning the whole system; proving the indifferent and costly way in which fitting work and repairs, both for ourselves and the consumers, was carried out, and advocating thorough reform, including—(1) Additions to the staff for stoking and yard work. (2) The engagement of a thorough mechanic and fitter. (3) Power to hold an exhibition of cooking, heating, and lighting apparatus in the Town Hall during the following summer. (4) Full licence to hold the necessary stock and stores of apparatus and fittings, and to let cooking-stoves out on hire. (5) To undertake gas-fitting in any shape or form which might appear advantageous. (6) To lower the price of gas used for cooking and heating purposes, excepting by the use of boiling-burners only, by 10d. per 1000 cubic feet (from 4s. 2d. to 3s. 4d.). I will not at this time attempt to describe the meeting; suffice it to say that my report was adopted.

The exhibition was held from the 18th to the 21st of June (four days). This was, I suppose, of the usual character. At the head of the room a lady lecturer demonstrated twice daily on plain and fancy cooking; including on one evening the preparation complete of a five-course dinner for five or six persons. A test meter, facing the audience, was fixed to record the consumption of gas in the stove used; the cost being given at the close of the lecture. Opposite, at the bottom of the hall, eight different sizes of ranges were shown, both enamelled and plain; while on either side were arranged a variety of other apparatus—including fires, bath-heaters, boiling-burners, coffee-roasters, airers, washing-machines, grillers, &c.—any of which could be instantly lighted up. Arranged round the walls on brackets were various types of lamps and burners, illustrating flat-flame, Argand, and regenerative lighting. Pamphlets and papers were widely distributed, and posters adorned the walls. Specimens of some of these are on the table for the inspection of any who may be interested. Admission was entirely by invitation ticket. I may here mention that the whole of the cooking and heating

apparatus exhibited were Messrs. T. Fletcher and Co.'s, and that I have kept exclusively to that firm's manufactures.

To my mind it is of primary importance that a gas company's goods and work should be second to none. For this reason I will supply no other form of globe than the improved open bottom, and no other than the governor type of burner. The small galleries attached to brackets, &c., supplied from the manufacturers are removed, and thrown away. It is high time gas companies with fitting businesses combined to put pressure on manufacturers to stop, or at any rate to limit, the sale of these abominations. At present they are supplied with every bracket and chandelier manufactured, as part cost; and customers naturally object to give up an article once paid for, to incur the expense of a second.

The exhibition being held so late in June, little fixing of apparatus could be effected before the close of the quarter. From then, however, until now the work has rapidly proceeded; my fitter, until a few days ago, being on overtime until eight and nine at night. At the close of the exhibition, some 25 appliances were on order; while up to the present time upwards of 60 (omitting boiling-burners, &c.) have been fixed. This record, out of some 200 consumers, speaks for itself. A great deal of ordinary fitting work has also come in; and I see no reason to doubt the continuance of public favour and confidence. The net effect has been to return to us the whole of the extra wages; while we have also effected all our own main and service laying, meter fixing, and tool and general repairs.

It is our practice to let out on hire cooking-stoves only—the rental varying from 1s. per quarter for a stove suitable for four persons, to 3s. 3d. per quarter for one to cook for 15 or 20 persons, and the minimum term of hire being 12 months; but they are sold to consumers at a discount of 33⅓ per cent. Fires, bath-heaters, and all other apparatus, are supplied at 25 per cent. discount.

In fixing gas appliances, I charge cost price, and sometimes under, for those which affect the day consumption; and in all other cases allow for an ordinary profit. Every case of gas-fitting I personally inspect beforehand; instruct my man respecting the work, if necessary; and inspect again both while in progress and after completion. Should any difficulty subsequently arise, it is always put right without further expense to the consumer. Every opportunity is also taken to instruct consumers in the proper use of any apparatus they may have. By this means, satisfaction has ruled the day; and although it has necessarily entailed a great sacrifice of leisure time on my part, I feel that the results have well repaid the labour and risk.

In connection with my report to the Board, I mentioned a reduction of 10d. per 1000 cubic feet for gas used for cooking and heating purposes. With gas at 4s. 2d., and no immediate prospect of a reduction on ordinary ground, I felt that a secondary and lower rate was essential, in order to popularize the exhibition movement, and give a decided impetus to the consumption. You will the more readily understand this when bearing in mind that Wantage is supposed to be the oldest town in England, and now only numbers about 4000 or 5000 inhabitants; so that the prospect of the growth of the consumption of gas for lighting purposes by the influx of new consumers is not reassuring.

Some here may consider the drop of 10d. per 1000 feet too great under the circumstances, or may, perhaps, entirely discountenance a secondary rate. I do not. What is more, I believe that, however good the results due to the exhibition movement in any town may be, that a lower rate for heating and cooking gas would pay better. A consumer seems naturally to expect a reduction. The use of gas for cooking and heating purposes is very young compared with its primary function—lighting; and some incentive, some inducement to try it for other purposes should be offered. The very fact that such gas is delivered at less cost to us, should influence the question. Take a consumer adopting some apparatus; the consumption is always largely increased, and often doubled. What does that gas cost the distribution department? Nothing. You use the same main, the same service, and the same meter. The leakage is unaltered, unless the pressure is augmented; but the bulk of such gas being used in the day affords little excuse for that. In my own case, the works are the property of the town. No surplus profits are made; the selling price (4s. 2d. per 1000 feet) being practically the cost of working and delivery to the consumer under our circumstances. Say, for argument's sake, our leakage is 10 per cent. It is known well enough that services cause the bulk of the loss from leakage; and each service presumably goes to a consumer. Therefore all extra gas delivered through such service, being free from leakage, cost us one-tenth less. It can be sold at 3s. 9d. per 1000 feet apart from any question of increased economy in production at the works, which every manager knows must follow.

With a differential charge for gas, therefore, the question arose as to how the relative quantities used for heating and lighting respectively were to be determined. I was aware of the double-index meter system, and also that separate meters might be put in to take the cooking and heating consumption. But neither plan commended itself to my mind, on account of the expense involved, and the difficulty in the latter case of inducing consumers to face the outlay of the duplicate service. After careful consideration, I determined to try the following plan:—In the great majority of cases the consumption of any individual consumer for lighting purposes remains fairly uniform from year to year; the consumption for any particular quarter comparing pretty closely with that for the corresponding period of the previous year. At any rate, should any fluctuations occur in the shape of an increase, they are not slow to require an explanation. Taking, therefore, the four quarters ending March 25, 1889, as the basis for lighting purposes, it was agreed that the adoption of any stove, fire, or other apparatus would necessarily make the total consumption greater; and that whatever increase there might be in each quarter over and above the four quarters to March 25, 1889, should be chargeable at the lower rate. The effect of this is that a great many consumers have adopted some kind of appliance who would not have entertained the idea had a duplicate service and meter-rent been necessary; to say nothing of the horror some have of the idea of the house being turned upside down "for those gas men." Again it is a direct incentive to a more liberal use of gas for lighting purposes; this extra consumption of course going in at the lower rate. In the case of an account heavier than usual—from late hours, inclement weather, or what not—it is useful to be able to point out how much heavier it might have been had not the consumer adopted some adparatus, and so become entitled to have all the increase charged at the lower scale. On the other hand, since no reduction is allowed except on an increase over the 1889 consumption, the works are protected from a diminution of income from these consumers, as far as it is possible to go; so that in the case of a consumer adopting (say) the albo-carbon light, the reduction on the lighting consumption has to be made good by a part of the heating consumption—the balance only coming in at the lower rate. But in other words, a consumer effecting economy in his lights gets the reduction on the consumption charged at the heating and lower rate first, and not until the whole extra consumption of a fire or stove has been wiped off, can the actual lighting rate be effected. Of course, this in some cases makes the cost of the fire or stove appear remarkably small. The consumer, however, in getting such conveniences so cheaply is well satisfied; and so am I. In the case of new consumers, duplicate meters and services are generally put in; but in some cases they prefer the account to be proportioned by us. In such instances, while dealing as fairly as possible, you may be sure my award does not unnecessarily prejudice the legitimate income of the works, nor make the cooking and heating figure appear too costly.

Such, then, is the plan adopted; and to complete this paper, and justify the steps taken, I have only to give you the result. Although the appliances were being fixed during the September quarter, and consequently had not developed the full effect we shall experience in the future, our registered consumption for that period is 30 per cent. higher. Appliances were being fixed at intervals through the Christmas quarter; and although it is with us by far the heaviest quarter for lighting purposes, yet the registered consumption was up 15 per cent. The total quantity of gas registered for heating and cooking apparatus in the Christmas quarter was 36 per cent. in advance of our September figure; and I therefore believe that another summer quarter will give us a 40 per cent. advance. I am sorry this meeting is being held a little too early to enable me to give the exact figure for the present March quarter, which closes in a fortnight's time; but from my books I find the increased output well maintained, and expect that if any difference is found it will be still higher. I would add that the output is really greater than the figures given. Several new consumers have been obtained, and the public lighting greatly augmented by the adoption of Sugg lamps in the Square, and other improvements; but the figures given are purely the exhibition results.

This, gentlemen, is all I have to say on this subject at present. The scheme of arranging the consumption is, I believe, a novel one. Whether or not it is applicable to large towns, I leave to the judgment of those engaged in them. It is, I think, well enough adapted to small places with limited capital and stunted growth; while the excellence of the results can hardly be questioned. The paper is offered primarily to put heart into those managers who have not yet dared to move from the customs of bygone days, or "to brave the lion in his den" over that bone of contention, the "gas-works fitter," and the little tit-bits of income one meets with it. To those I would say that, if no opposition were offered, one could be sure there was little to be gained. Go and do likewise, is my advice. There are doubtless others who have long since successfully engaged in the work. If any such can find in this narrative food for reflection, or some stray new idea, so much the better. The best among you can at least leave with the pleasing reflection of how much better he has done.

Discussion.

Mr. A. V. Daniel (Portishead) recommended to the consideration of the meeting the ideas advanced in the paper, as some years ago he had, he said, applied the plan of supplying at a cheaper rate gas used for heating or cooking, and apportioning the consumption in the manner indicated by Mr. Dexter. The result was thoroughly satisfactory; and the consumers were pleased at not being put to extra trouble and expense for duplicate services, meters, or pipes. Perhaps the idea of charging the increased consumption at a reduced rate did not sound quite parliamentary; but it answered well in small works,

Mr. H. Sainsbury (Trowbridge) said that for some years he had been letting stoves on hire; and it was his practice to lay the supply-pipe from the meter entirely free of charge, and to do at his own cost everything in connection with the fitting of the stoves. He had about 100 stoves on hire; but the number did not increase much. An exhibition was held some time since, and it caused a run on the stoves for a time. But several of the new customers returned the stoves when they found their gas bills increased; so it was doubtful if the exhibition did any permanent good. The gas-stoves did not answer well in large houses—perhaps because the cooks used the gas freely, and kept the fires going as well. It was the middle class and the better class of working people who appeared to like the stoves best, and to retain them permanently. He was afraid that in factory towns the users of large quantities of gas for lighting purposes would raise objections against the supply of gas at cheap rates for stoves.

Mr. West said he was interested in hearing the paper, and thought the writer had done well to take up new lines, and some were no doubt applicable in small towns. The fact that gas had not been more generally used for heating and cooking was due—he said it with all deference—to the laxity of gas managers. Some 36 years ago he went to a gas-works where stoves were being made, let out on hire, and sold, just as many were beginning to do now; and the day consumption in the district was at present larger than any other of which he knew. Another works where similar lines had been followed came second; and this showed that it rested with the managers whether or not the business was increased in this direction. By educating the consumers—and if the manager had any status in a place he was the only man to whom people would listen—the use of stoves could be further advanced. He hardly agreed with the idea of a gas company undertaking all the fitting work, as there were many tradesmen about who were able to do gas-fitting quite as well. But he thought that the gas company should exercise some kind of supervision as to size of pipes, &c. It was scarcely wise to say: "We will have only one make of stove, or one kind of burner." He recommended enterprise in giving away gas-burners, fixing stoves gratis, &c., and in trying to get a good day consumption, which, as Mr. Dexter had said, meant 30 or 40 per cent. more gas through the same mains and services. If properly advocated, gas would hold its own on its own merits, without the inducement of a large reduction in price.

Mr. J. H. Lyon (Cosham), who was absent on account of illness, wrote to say that he was sure every effort should be made to create a greater consumption of gas for cooking and heating purposes; and the present was a most favourable time to push the idea, the price of coal being so high. Any consumer who once gave gas a fair and unprejudiced trial for cooking purposes would never return to the use of coal. At Petersfield he lent out 20 stoves, and believed there were now 25 in use, which was equivalent to one cooker to every six gas consumers. This was not a bad average for a place of that size; and the sale of gas for cooking showed a good percentage on the production. To make the adoption of gas for cooking purposes as popular as possible, he charged 1s. per 1000 cubic feet less for gas so used than the rate for lighting purposes; and to consumers who had employed gas for lighting purposes more than twelve months, to save them meter hire, he charged all increased consumption on the corresponding quarter at the cooking rate. During the time he had the works this answered very satisfactorily. As managers they ought not to lose any opportunity of increasing the popularity of gas, and should treat their customers with every liberality, advise them in all matters relative to the economical use of gas, and show them what burners would yield them the most value in light for the gas consumed.

Mr. H. C. Shepherd asked if any extra charge was made for duplicate services, if preferred, or for enlarging the service to meet the requirements of the stove.

Mr. G. Walker (Westbury) inquired if Mr. Dexter charged for laying a new pipe from the meter to supply a stove.

Mr. Dexter, in reply, pointed out that Mr. West had misunderstood him with regard to the supply of burners. He did not confine himself to any particular kind, but only to governor burners. He would not supply a non-regulator burner, because while they increased the light, they would also increase the consumption, and make the consumer suspect that the burner was only given with this intention. No doubt in large works a show comprising a great variety of stoves might be kept; but for small works it was better to keep to one make. His practice with regard to services and fittings was to supply everything up to the meter free of charge; and to do fittings for day consumption at cost, and others at trade charges.

Controlling a Gasholder at a Distance.

The President invited discussion on the subject of the management of a district gasholder at a distance from the works, and without a special trunk main; such holder giving a pressure greater than it was desirable to put on the ordinary distributing system. He said he was contemplating the erection of a new holder at the tar-works, which were a mile and a half from the gas-works, and he proposed to connect by a 10-inch main with the nearest point of his distributing plant, which was half a mile from the site. There would be the usual governor and bye-pass for distribution; but on the bye-pass he proposed to fix an exhauster and another valve. The question was, would he be able to fill up the holder during the daytime by working the exhauster? There would be telephonic communication between the works and the holder station.

Mr. S. W. Durkin (Southampton) thought that, under the circumstances, a separate main would be best. He had some recollection of a gasholder, built in an out-district, which had to be filled during the day, and was counterbalanced for the purpose, so as to reduce its pressure from 4 to 1½ inches. He believed it was supplied through a separate main; but was sure such a plan would be safest. At Winchester, where the gasholders were situated at a distance from the works, separate inlet mains were used.

Mr. D. Irving (Bristol) knew of similar cases to that mentioned by the President; but he said that in all these a direct main was used. So far as he was concerned, the risk of over-exhaustion, oscillation in the main, and uncertainty of working the scheme would be sufficient to lead him to reject it; and he therefore thought the President would do well to put in a separate trunk main. The starting and stopping of the exhauster would of necessity affect any light supplied from the main; and everyone knew how much dependence it was safe to place upon men and machinery. He would also prefer to "drive," and not to "draw" the gas. It was very desirable to keep the system of distribution at one centre, and under one control.

Mr. E. J. Lloyd (Bristol) said a case had once come under his notice in which the crown of the supplying gasholder was drawn in as the result of continuing to work an exhauster for supplying a district holder after it had been emptied.

Mr. West said he had had some experience with a plan somewhat similar to that suggested by the President. At an out-district in Manchester there was a set of four gasholders, and it was necessary to supply them at once from the old works. Time did not admit of laying a separate main, and they tried to fill them from the ordinary system; but the result was that they were practically obliged to make a separate supply main, by introducing valves at various points to shut off connection with other parts of the canalization. He had never felt quite happy about it, as there might be neglect in turning the valves. The plan carried him through, and he believed it was still in operation; but he would not recommend it. The cost of the exhauster, &c., would go a long way towards paying the expense of a new main; and the latter might be useful in other ways. He understood that the President intended eventually to move his retort-house to the new site; and the main would then serve to bring gas back to the holders at the present works. The exhauster created such pulsation in the main that all lights supplied from it would have to be shut off while it was at work. On one occasion the closing of the valves was forgotten at Manchester; and then the water was drawn out of some of the wet meters.

Mr. W. Davis (Poole) thought there was no doubt that the putting down of an independent main would be the safest plan. But if the President was willing to try, the experiment need not be costly, and might be found to be safe and economical. Of course, it was necessary that the mains should be large enough. To prevent the pulsations of the exhauster reaching the mains, a small gasholder (say) of 100 cubic feet capacity, might be provided for it to draw from.

Votes of Thanks.

Mr. H. Sainsbury said he should like to propose a hearty vote of thanks to those gentlemen who had assisted the proceedings that day. Some had read papers, others had spoken, and others had sent models. The whole had resulted in an extremely interesting meeting; and they would all go away with several new notions to think about, and, he hoped, to usefully apply in future.

Mr. J. H. Gray (Weston) seconded the proposition; and it was carried with applause.

The President proposed a vote of thanks to Mr. Deane, the Engineer of the Great Western Railway Works, for kindly giving permission to the Association to visit them.

Mr. W. H. Brinkworth (Chippenham) seconded the proposition, and it was heartily carried.

The business then concluded; and the members and visitors proceeded to inspect the railway works, an account of which appeared in the Journal for the 18th ult.

The Trial of Electric Meters in Paris.—It may be remembered that some time ago the electrical authorities in Paris offered several prizes for the best instruments for recording the consumption of electrical energy, with a view more especially of choosing a suitable meter to use in the systems of electrical distribution. A large number of makers sent in meters—viz., Desroziers, Aron, Ferranti, Richard, Bauer, Cauderay, Jacquenier, Leslie, Batault, Weber, Brillié, Clerc, and Blondlot. Although, according to the Paris correspondent of *Industries*, the judges did not consider that any of the appliances were sufficiently excellent to deserve the premium offered, the following grants were made:—M. Cauderay, 2000 frs.; M. Aron, 2000 frs.; M. Brillié, 1000 frs.; M. Blondlot, 1000 frs.; M. Jacquenier, 1000 frs. On account of the premium not being awarded, and also because several meters arrived too late, the judges have decided to hold another trial in August next.

THE SPONTANEOUS IGNITION OF COAL.

At the Thirty-first Session of the Institution of Naval Architects, recently held at the Society of Arts, Adelphi, a paper on the above subject was read by Professor VIVIAN B. LEWES, F.I.C., F.C.S. The matter was alluded to in our editorial columns last week; but it is of sufficient importance to gas managers to justify more extended notice. We therefore give an abstract of the paper, with a report of such portions of the discussion thereon as bear specially upon the points of most interest to our readers.

The author began by referring to the appointment of a Royal Commission in 1875, on the proposition of the Board of Trade and a Committee of Lloyds, to investigate the causes of the spontaneous ignition of coal cargoes, which had entailed serious loss of life and destruction of property. The Commission were assisted by Dr. Percy and Mr. (now Sir Frederick) Abel; and the result of their labours was the production of a report containing much sound advice for the guidance of persons employed in the shipment of coal. Nevertheless, accidents from the spontaneous ignition of cargoes continued; and between 1875 and 1883, no less than 57 coal-laden vessels were in consequence known to have been lost, while during the same period 328 were missing from unknown causes, though probably a large proportion of these losses were due to the one mentioned. In view of this fact, it was suggested to Professor Lewes that an inquiry into the causes and possible prevention of this serious evil was greatly needed in the Royal Navy as well as in the merchant service; and therefore he undertook it, and laid the results before the members of the Institution.

Having made these explanatory remarks as to the origin of his investigation, the author proceeded to consider in detail the various constituent elements of coal, and pointed out that, besides the carbon and hydrocarbons, it contains certain mineral substances, as sulphate of lime or gypsum, silica, and alumina, whilst in nearly all kinds there is to be found disulphide of iron and coal "brasses," or pyrites. Of these constituents, those which are likely to produce heat, and cause spontaneous ignition in newly-won coal, are the carbon, hydrocarbons, and brasses, which, when they come into contact with air and moisture, give rise to certain chemical actions. He then described at length the influence of each of these constituents in the production of heat. Taking carbon first, he remarked that it is one of those substances which possess, to an extraordinary degree, the power of attracting and condensing gases upon their surface—the power varying with the state of division and density of the particular form of carbon used. In the case of newly-won coals, the least absorptive would, he said, take up 1¼ times, while others would absorb three times their own volume of oxygen. This absorption is very rapid at first, but gradually decreases; and it is influenced to a very great extent by temperature. Air-dried coal absorbs oxygen more quickly than wet coal.

Dealing in the next place with the action of the bituminous constituents of coal in causing spontaneous ignition, the author explained that all coal contains a certain percentage of hydrogen, which is in combination with some of the carbon, and also with the nitrogen and oxygen, and forms with them the volatile matter in the coal. The amount present in this condition varies very largely; being very small in anthracite and very great in cannel and shale. When the carbon of the coal absorbs oxygen, the compressed gas becomes very chemically active, and soon commences to combine with the carbon and hydrogen of the bituminous portions, converting them into carbon dioxide and water vapour. This chemical activity increases rapidly with rise of temperature; so that the heat generated by the absorption of the oxygen causes it to rapidly enter into chemical combination. Chemical combination of this kind—*i.e.*, oxidation—is always accompanied by evolution of heat; and this further rise of temperature again increases rapidity of oxidation, so that a steady rise of temperature is set up. This taking place in the centre of a heap of small coal, which, from the air and other gases enclosed in its interstices, is an admirable non-conductor of heat, will often cause such heating of the mass that if air can percolate slowly into the heap in sufficient quantity to supply the necessary percentage of oxygen for the continuance of the action, the igniting-point of the coal would be soon reached. It has been suggested that very bituminous coal (such as cannel, shale, and coals containing schist) is liable to spontaneous ignition from the fact that a rise in temperature would cause heavy oils to exude from them, which, by undergoing oxidation, might cause rapid heating. Experiment, however, not only shows that this is not the case, but that the heavy mineral oils have a remarkable influence in retarding heating.

The action of iron disulphide, pyrites, or brasses, in promoting spontaneous ignition, was next discussed. The author said that ever since Berzelius first expressed the opinion that the heat given out by the oxidation of iron disulphide into sulphates of iron might have an important bearing on the heating and ignition of coal, it had been adopted as the popular explanation of that phenomenon; and although the work of Dr. Richters clearly proved this not to be the case, the old explanation was still given. A notable exception, however, was to be found in the case of that great metallurgist Dr. Percy, who, as early as 1864, pointed out that probably oxidation of the coal had also something to do with spontaneous combustion—a prediction amply verified by Dr. Richters's researches some six years later. This disulphide of iron was found in coal in several different forms—sometimes as a dark powder distributed throughout the mass of the coal, and scarcely to be distinguished from coal itself. In larger quantities it often formed thin golden-looking layers in the cleavage of the coal, whilst it sometimes occurred as large masses and veins, often from 1 inch to 2 inches in thickness; but inasmuch as these masses of pyrites were very heavy, they rarely found their way into the screened coal for shipment, many hundreds of tons of these brasses being annually picked out from the coal at the pit's mouth, and utilized in various manufacturing processes. If the air was dry, the pyrites underwent but little change at ordinary temperatures. In moist air, however, they rapidly oxidized when in a finely-divided condition—the first action being the formation of ferrous sulphate and sulphur dioxide, together with the liberation of sulphur; the relative amounts of the two latter being regulated by the temperature and the supply of air, whilst longer contact with moist air converted the ferrous sulphate into a basic ferric sulphate generally termed "misy." It was during this process of oxidation that the heat supposed to cause the ignition was evolved. But when it was considered that some of the coals most prone to spontaneous combustion contained only 0·8 per cent. of iron pyrites, and rarely more than 1·25 per cent., the absurdity of imagining this to be the only cause of ignition became manifest. If 100 lbs. of coal were taken, and the whole of the pyrites in it concentrated in one spot and rapidly oxidized to sulphate, the temperature would barely be raised to 100° C. if all loss of heat could be avoided. The author had carefully determined the igniting-points of various kinds of coal, and found them to be as follows:—

Cannel	698° F.	= 370° C.
Hartlepool	766° „	= 408° „
Lignite	842° „	= 450° „
Welsh steam	870½° „	= 477° „

So that no stretch of imagination could endow the small trace of pyrites scattered through a large mass of coal, and undergoing slow oxidation, with the power of reaching the needful temperature. Dr. Richters fully realized this point, and discarded the idea of the pyrites doing anything more than adding their mite to the causes which bring about rise of temperature. In this, however, Professor Lewes thought the Doctor was mistaken; his own experiments pointing to the fact that they might increase the liability to ignition when present in large quantities, and do so by liberating sulphur under certain conditions. A still more important part played by the pyrites is that as they become oxidized to ferrous sulphate they swell in size, and so tend to split up the coal into small pieces, and, by exposing a large extent of fresh surface to the air, cause increase of temperature and energetic chemical action.

Professor Lewes then traced the actions which culminate in ignition. He said that on newly-won coal being brought to the mouth of the pit, and at once began, by virtue of its surface action, to absorb oxygen from the air. Unless piled in unusually large heaps, and a good deal broken, it did not, however, as a rule, show signs of heating, as the exposed surface was comparatively small; and the air, finding its way freely between the lumps, kept down the temperature. The coal was now screened; and the obtrusively large lumps of brasses picked out. It was then put into trucks, and enjoyed the disintegrating processes of joltings and shuntings innumerable—every jar adding to the percentage of small coal present, and a corresponding increase in the size of the surface exposed to the air. Arrived at the docks, it had to be transferred from the truck to the ship, which was done by one of the numerous forms of tips, shoots, or spouts employed for the purpose; and it was during this operation that more harm was done than at any other period. The coal first shot into the vessel was, by reason of the distance which it had to fall, broken down into small lumps, and, having to bear the impact of the succeeding load falling upon it from a height, rapidly became powdered into slack; whilst the succeeding loads, falling in on the cone so formed, became more or less broken down, so that by the time the cargo was all taken in, a dense mass of small coal was to be found under the hatchway. It was invariably at this point that heating took place, as the large surface exposed fresh to the air by the breaking down of the coal caused rapid absorption of oxygen, and consequent rise of temperature. This set up chemical combination between the oxygen absorbed by the coal and the hydrocarbons and coal brasses. The combination of the brasses with oxygen caused the swelling of the oxidized mass and the splitting up of the coal. Fresh surfaces were exposed, and more absorption of oxygen took place; and the igniting-point of the sulphur vapour and sulphur compounds distilled out of the pyrites was reached, and rapidly raised the temperature to the ignition-point of the coal. It was only, however, in cases where large quantities of dense coal brasses were present, that this action could occur. On examining the evidence to be obtained as to the conditions under which spontaneous ignition of coal in ships usually takes place, Professor Lewes found that the liability to such accidents increases with (1) the tonnage of the cargoes, (2) the ports to which shipments are made, (3) the kind of coal of which the cargo consists, (4) the size of the coal, (5) the shipping of coal rich in pyrites while wet, (6) the ventilation of the cargo, and

(7) the rise in temperature in steam colliers due to the introduction of triple-expansion engines and high-pressure boilers.

Having discussed the chemical and physical conditions which lead to the spontaneous ignition of coal, the author proceeded to formulate precautions tending to prevent such disasters. These had reference to the choice of coal for shipment to distant ports, and to the precautions to be taken during shipment, and when the coal is on board. He advised that the coal should be as large, free from dust, and have as little "smalls" as practicable. It was better as free from pyrites as possible, in order to prevent disintegration after shipment; and it should contain, when air-dried, not more than 3 per cent. of moisture. No coal should, he said, be shipped to distant ports until at least a month had elapsed since it was brought to the surface at the pit's mouth. Every precaution should be taken to prevent the breaking up of the coal while being taken on board; and on no account should any accumulation of fine coal be allowed under the hatchways. When possible, the coal should be shipped dry; as external wet, by producing oxidation of the pyrites, caused disintegration. When the coal had all been taken in, it should be battened down, and the hatches not opened again until the vessel reached her destination; the only ventilation allowable being a 2-inch pipe just inserted into the crown of each coal compartment, and led 12 feet up the nearest mast—the top being left open. This would be quite sufficient to allow free egress to any gases evolved by the coals, but would not allow undue access of air. Into the body of the coal cargo itself would be screwed, at regular intervals of about 6 feet, iron pipes, closed at the bottom, and containing electrical alarm thermometers, set at a certain temperature, the attainment of which would be indicated by the ringing of a bell, which would not cease until the temperature had again fallen, and then the spot in which the heating had taken place would be indicated by an index-board. The existence of overheating having been reported by the bell, and recorded by the index, the author offered suggestions for suppressing it. He advocated the ejection into the air of compressed carbonic acid gas; and explained his plan as follows:—If carbonic acid gas is compressed under a pressure of 36 atmospheres at a temperature of 32° Fahr., it is condensed to the liquid state, and can be obtained in steel vessels, closed with screw-valves. On opening the valve, some of the liquid is ejected into the air; and on coming down to the ordinary atmospheric pressure, is in a moment converted into a large volume of gas. Conversion from the liquid to the gaseous state means the absorption of a large amount of heat; and so great is this that everything near the stream of new-born gas is cooled down, and some of the escaping liquid is frozen to a solid, having a temperature of — 108·4° Fahr. (— 78° C.). I should suggest its use in the following way for the checking of ignition in the coal cargo:—The nozzle attached to the screw valve on the bottle of condensed gas would have a short metal nose-piece screwed on to it, the tube in which would be cast in solid, with an alloy of tin, lead, bismuth, and cadmium, which could be so made as to melt at exactly 200° Fahr. (93° C.). The valve would then be opened, and the steel bottle buried in the coal during the process of loading. The temperature at which the fusible metal plug would melt is well above the temperature which could be reached by any legitimate cause, and would mean that active heating was going on in the coal. Under these conditions, the pressure in the steel cylinder would have reached something like 1700 lbs.; and the moment the plug melted, the whole contents of the bottle would be blown out of it into the surrounding coal, producing a large zone of intense cold, and cooling the whole of the surrounding mass to a comparatively low temperature. The action, moreover, would not stop here, as the cold, heavy gas would remain for some time in contact with the coal—diffusion taking place but slowly through the small exit-pipe. When coal has absorbed as much oxygen as it can, it still retains the power of taking in a considerable volume of carbonic acid gas; and when coal has heated, and then been rapidly quenched, the amount of gas so absorbed is very large indeed, and the inert gas so taken up remains in the pores of the coal, and prevents any further tendency to heating. Indeed, a coal which has once heated, if only to a slight degree, and has then cooled down, is perfectly harmless, and will not heat a second time. It is not by any means necessary to replace the whole of the air in the interstices of the coal with the gas, as a long series of experiments show that 60 per cent. of carbonic acid gas prevents the ignition of the most pyrophoric substances. A hundred cubic feet of gas can be condensed in the liquid state in a steel cylinder 1 foot long and 3 inches in diameter; and it has been shown that a ton of coal contains air spaces equal to about 12 cubic feet. One of these cylinders would therefore have to be put in for every 8 tons of coal; and these would be distributed evenly through the cargo, and near the alarm thermometers, which would be set to ring a degree or two below the point at which the fusible plug would melt. The bell ringing in the captain's room would warn him heating was taking place, and the bell would continue to ring until the cylinder had discharged its contents, and had cooled down to a safe degree, so that the whole arrangement would be purely automatic, and yet the officers would know if everything was safe. If the precautions advocated were taken, no danger could arise until the arrival of the ship at her destination, and the commonest precautions would then suffice.

In conclusion, Professor Lewes remarked that the question of preventing the heating and ignition of stores of coal on land and ready for use in bunkers could not be met so well by the use of the liquid gas; and in these cases it would be found beneficial to dress the coals with a little tar or tar oil, which would close the pores, and to a great extent prevent oxidation. He believed this was advocated by Lachman about 1870. Crude petroleum in small quantities for this purpose would also be found valuable; for it had no tendency to oxidize itself, and lowered the tendency in other bodies, besides coating them and so preventing access of oxygen.

The paper was illustrated by some interesting and convincing experiments, the successful performance of which elicited considerable applause from the audience.

In the course of the subsequent discussion,

Professor Elgar, referring to the statements in the early part of the paper that, between the years 1875 and 1883, no less than 328 coal-laden vessels were missing from unknown causes, and that a large percentage of these losses were undoubtedly due to spontaneous ignition, argued that there were a number of other causes which might account for their disappearance; and he then gave some particulars as to the losses during the three years from 1881 to 1883. In that period there were 23 known losses of vessels from spontaneous combustion of coal; but only one of these was a steamer—the other 22 being sailing vessels, the larger number of which were built of wood. He thought that one cause of spontaneous combustion in wooden ships was the impossibility of keeping the holds dry, and to the coal becoming damp and generating heat. Under the American law, ships registered in the United States were obliged to be fitted with steam-pipes in their holds, for the purpose of dealing with fire; and he asked Professor Lewes whether ships fitted in such a way would have a better chance of keeping down and dealing with combustion than if they were not so fitted.

Mr. W. Parker said that the subject of the spontaneous combustion of coal was brought before his notice some few months ago in connection with a Committee of Lloyds, who requested him to investigate the matter. He proceeded to read the report which he made on the question, and which had not been previously published. It generally corroborated the views of Professor Lewes as to the causes of the spontaneous ignition of coal in bunkers; and his recommendations for the prevention of the trouble ran on somewhat similar lines.

Mr. Martell suggested that it would be an excellent thing for the members if such a gentleman as Professor Lewes were appointed to act as Consulting Chemist to the Institution; so that matters requiring chemical investigation in connection with their particular business could be referred to him.

Mr. Macfarlane Gray, referring to the author's proposal to distribute cylinders containing carbon dioxide throughout a cargo of coal, said it appeared to him that they would require too many of them in a ship's hold. His idea was that the heat one of these would cancel would be a mere fraction of what a pound of coal would give by combustion.

Professor Lewes: By this plan, you fight the coal before the heat is got up.

Mr. Eckersdale, Inspector of Machinery in Collieries, &c., emphasized the importance of not storing coal in a wet condition; and pointed out the importance of ascertaining the percentage of moisture in coal before purchasing it, as in buying coal containing (say) 10 per cent. of moisture, instead of 4 per cent., the purchaser paid for something which was not only useless but injurious.

Mr. J. Cory was afraid it would not be practicable to carry out some of Professor Lewes's remedies for the prevention of spontaneous combustion. For instance, he laid great stress on having no small coal under the hatches; but he (the speaker) could not see how it was possible to load a vessel without producing small coal. However, there was a great deal of useful information and many suggestions in the paper.

Mr. Stromeyer inquired how it was that coal in the centre of a cargo took up instead of giving off gases, as they would naturally expect.

Professor Lewes, in the course of his reply upon the discussion, said there was no doubt that the cooling power of steam upon coal under ignition was very great, because of the enormous absorptive power for heat that steam possessed. He knew that his unfortunate carbon dioxide cylinders would be "dropped upon." The cylinders required would not take up much space; and it would be a simple matter to place one here and there when the cargo was being loaded. With regard to the production of small coal in loading, he said that this could be to a great extent obviated by loading the vessels by barrows, instead of sending the coal into the hold by means of a shoot. As to Mr. Stromeyer's question, if they took a piece of coal and put it in oxygen, it would absorb a certain quantity at a certain temperature; if it was warmed a little, it would absorb more. They had this action going on in vessels. Oxygen was drawn in with the small quantities of air passing through the coal. This was why he urged that the cargoes should be battened down, and no air permitted to enter.

On the proposal of the Chairman (Earl Ravensworth), a hearty vote of thanks was accorded to Professor Lewes for his paper.

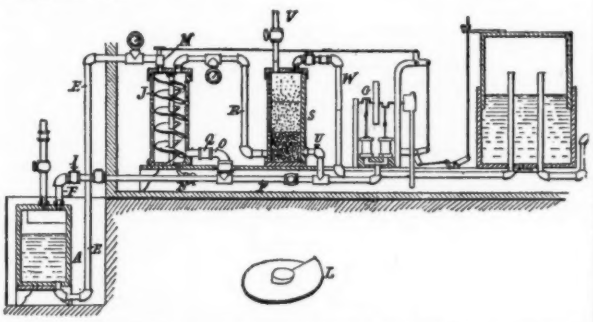
REGISTER OF PATENTS.

Fluid-Meters.—Sporton, H. H., and White, E., of Enfield. No. 14,869; Sept. 20, 1889. [8d.]

This invention relates to meters (like those described in patent No. 13,395 of 1885) in which the fluid is caused to pass through a series of openings in such a manner as to impinge against the vanes of a fan arranged adjacent to the openings, and to rotate the same; the motion of the fan being utilized for operating the registering mechanism. The patentees assert that the defect of such meters as hitherto constructed is that, when only a small quantity of fluid is passing through them, the jets issuing from the openings do not impinge with sufficient force against the vanes of the fan to cause the rotation of the same. According to their invention, a second series of openings is arranged adjacent to the first series, but of much smaller area; and in connection with the first series of large area, there is arranged a valve, which, when more than a given volume of fluid is flowing through the meter in a given time, is adapted to be raised by the pressure of the fluid itself, thereby allowing the fluid to issue through the series of large openings to rotate the fan. When, however, the flow of liquid is below a given quantity in a given time, it has not sufficient pressure to lift the valve; and so it passes only through the series of small openings, but still at a sufficient velocity to rotate the fan.

Manufacture of Carburetter Gas.—Hargreaves, G., Scranton, J. P., and Porter, E. W., of Detroit, Mich., U.S.A. No. 19,449; Dec. 3, 1889. [8d.]

This apparatus for manufacturing gas consists of a carburetter, into which the hydrocarbon oil is fed in small quantities under pressure from a storeage tank, an air compressor and feed-pipe, a connection from the air feed-pipe into the carburetter, and a pressure-valve in the connection.



A is a closed storeage tank for containing hydrocarbon introduced through a pipe entering at the top. Two pipes E and F connect with the tank—the former into the bottom, and the other into the top. The pipe F connects the air-pumps G with the storeage tank, for the purpose of charging the top of the tank with compressed air, for two objects—first, to prevent loss from evaporation, by preventing the free contact of the gasoline with the outer air; and second, for the purpose of elevating the gasoline in the feed-pipe E. A check-valve is placed in the pipe F, to prevent the air-pressure in the tank from escaping back through it; and an ordinary valve I is also preferably placed in the same pipe between the check-valve and the tank, for contingencies. J is the carburetter, placed above the level of the gas-tank. It consists of a cylindrical vessel, provided with a detachable head and a support secured in the axle of it, and upon which are sleeved a vertical series of spirally inclined planes L, as shown in detail at the foot of the engraving. These spirals are preferably made of metal, and each forms just one turn. In arranging them upon the support, the spirals do not form a continuous pathway—each is turned back about one-quarter of a revolution to the one next above it; and the edges of the spirals extend into contact with the walls of the vessel J. The feed-pipe E enters the top of this vessel, and is provided, at or near its discharge end, with a "needle valve" M, with one or more openings for regulating the flow of oil into the top of the vessel. The bottom of the vessel is provided with a waste-pipe N controlled by a valve, and a connection O with the air-feeding pipe F, in which connection there is placed an ordinary valve, and a pressure-valve Q set to open at a fixed pressure. A pipe R leads from the top of the carburetter into the bottom of another vessel S, which constitutes the purifier, and in which there are different layers of purifying material separated by perforated diaphragms. This purifying tank has a connection U (controlled by a valve) with the air-feeding pipe F. A pipe V, also controlled by a valve, leads from the top of the purifier into the condenser; and the pipe W having on it a check-valve leads from the top of the purifier into the gasholder. The holder is constructed in the usual manner, and arranged to automatically control the whole apparatus.

By means of the pump G, air is drawn through the carburetter J, and passes thence to the purifying tank, from which it escapes into the holder. On the holder becoming filled, the arm on the top engages with the upper stop shown, and thereby lifts up the vertical rod. This actuates the belt-shifting device, and carries the belt on the pump from the fast on to the loose pulley. At the same time, the rod connected to the handle of the valve M will be actuated so as to shut off the oil supply to the carburetter. Thus, the further production of gas is stopped until the holder becomes nearly empty. Then the arm will strike the lower stop on the vertical rod, and thereby actuate the belt-shifting device to set the pump in motion, while at the same time the oil is turned on, and the gas making is proceeded with until the holder again becomes filled to a point regulated by the stops.

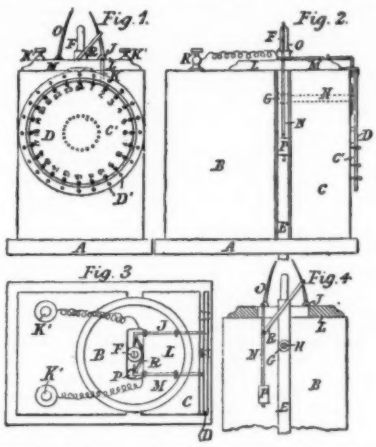
The pressure of the air always remains upon the top of the gasoline in the storeage tank, whether in or out of operation; and beyond what quantity of air is enclosed, there is no fresh air allowed to come into contact with the oil, and, as a consequence, the oil in the tank is not deteriorated, nor can loss from evaporation occur.

The connection U of the purifier with the air-feeding device F is for the purpose of revivifying the materials in the purifier after they have lost their purifying action, by closing the valves which connect it with the carburetter and the holder respectively and opening the valves in the connection U with the air-pipe and the escape-pipe V. By allowing the air to thus blow through the purifier, the material is restored to its original purity, and is fit to be used again.

Gas Lighters and Extinguishers.—Newman, N., of Springfield, Ill., U.S.A. No. 19,875; Dec. 10, 1889. [8d.]

This invention refers to apparatus combining time mechanism having moving tappets, a gas-valve with tappet arms, and an electric sparking apparatus, having an operating lever or arm, also adapted to be operated by the tappets.

In the accompanying illustrations of apparatus embodying the improvements, there is shown supported on the base A, a rectangular box or case B, enclosing a suitable electric battery or other source of electricity (not shown). A case C, is also arranged at a suitable distance from one end of the battery case. In the case C is clock-work mechanism or some other motor (not shown) having its shaft



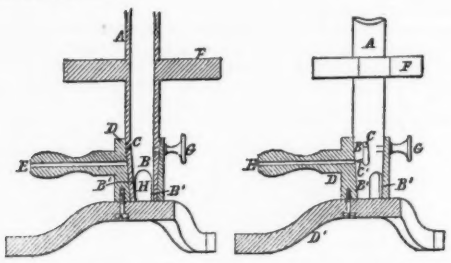
projecting through its front side adapted to revolve once in twenty-four hours. The disc D is fixed upon and revolves with this shaft. This disc is provided near its centre and at a suitable distance from its perimeter with series of openings (arranged in concentric circles), twenty-four in number, corresponding to the hours of the day. Near the perimeter of the disc is a third series of openings; and tappet pins are adapted to be inserted in any of the openings in either series. The gas-pipe E extends through the base, and is arranged between the opposing end of the battery and clock-work cases; and to the upper end of the pipe is secured the burner F. A valve G journalled in a seat in the pipe is of such construction that a very slight movement will suffice to turn on or cut off the flow of gas. A shaft H projects from one end of the valve; and to the outer end of the shaft are attached a pair of tappet arms of unequal length, and extending in opposite directions. The longer arm is adapted to be engaged by the pin in the first series of openings; and the shorter arm, by the pin in the second series. A plate L, secured on the upper sides of the cases B C, is circular in form, and has a central opening through which the burner projects. A rock-shaft J, mounted in suitable bearings on the plate L, has its inner end upturned and curved inward so as to form a contact arm. It has its outer end bent downward at right angles, in order to form a tappet arm K, which is in the path of the tappet pin in the third series of openings. A rock-shaft M, journalled in bearings on the plate is fitted parallel with the shaft J; having its inner end (provided with a contact arm O) adapted to meet the arm at a point above the burner, and with a depending pendulum arm N provided with a pendulum P. A link-rod R connects the pendulum arm to the contact arm; while a pair of binding posts K¹ are secured on the case B, and connected to the poles of the battery and to the shatfs J and M respectively by conducting wires.

The operation of the invention is as follows:—Assuming that it is required to light the gas at the ninth hour and extinguish it at the thirteenth hour, a pin is inserted in the opening 9 of the second series of holes; another pin in the opening 13 of the first series; and a third pin in the opening 10 of the third series. The axis of the valve and shaft J are not in vertical alignment; and therefore to compensate for the difference, the last pin must be set at a distance of one space in rear of the second pin. The clock-work mechanism being put in motion, revolves the disc D; and when the required time has elapsed, the second pin will engage the arm or tappet, and in moving past it, turn the valve a sufficient distance to cause the gas to flow from the burner. Before the second pin thus engages the arm, the third pin will come in contact with the lever K, and will be slowly moving it and turning the shaft J. The rod R, and pendulum rod to which it is attached, will then cause the shaft M to also turn in the opposite direction, with the result that the contact arms will be moved farther from each other than ordinary. The length of the arm and the lever K must be such that, at about the instant the second pin has moved past the arm and thereby turned on the gas, the pin will clear the lever K, and consequently set the pendulum in motion, thereby causing the contact arms to move alternately to and from each other, and alternately close and open the electric circuit, so as to produce a series of electric sparks, which serve to ignite the gas. When the hours intervening between the ninth and thirteenth have elapsed, the pin in opening 13 of the first series will engage the arm of

the valve-shaft; and in moving past the arm will turn the valve a sufficient distance to cut off the flow of gas through the burner, and thereby extinguish the light. As long, therefore, as the clock-work mechanism continues to operate, and while the same adjustment is preserved, the gas will be lighted at the ninth and extinguished at the thirteenth hour without any attention other than to keep the battery and the motor at work.

Bunsen Burners.—Reimann, G., of Berlin. No. 20,744; Dec. 24, 1889. [8d.]

This invention has for its object the simultaneous and corresponding regulation of the admission of gas and air to Bunsen burners. To this end the tube used in ordinary Bunsen burners for the exit of the gas is dispensed with, and the burner tube is made to act as a regulating cock both for gas and air.



A is a burner tube with a lower tapering or conical end B, forming a plug cock, through which is an inclined lateral slot or opening C for gas. This communicates, by a recess C¹ in the conical end, with a gas inlet passage E in the branch or union E¹, to which a flexible tube can be attached. The recess is of taper form, so that the cross sectional area of the passage for gas from the passage E can be varied by adjusting the position of the recess in relation to such passage. The lower part of the burner is secured by screws to a foot D¹; and it serves as a holder for the burner tube. It is formed with lateral air holes H, and carries a set screw G. The burner tube, which is furnished with handles F for turning it, has its conical lower end fitted in the holder D, in which it is retained by screwing in the set-screw G, so as to cause it to enter a slot in the tube. The recess C¹ and stop or opening C can, by turning the tube B, be either placed in communication with the gas-supply passages E, or this communication can be closed as desired.

The arrangement is such that when the tube B is turned so that the narrow part of the recess C¹ is opposite the inlet-passage E, and only a small quantity of gas can enter the recess C¹ and slot or opening C, the lugs or parts B¹ formed by slotting the lower conical end B of the tube A will be brought partially in front of the air-inlets H, so as to partly close them. Then by turning the tube B to a further extent to increase the area of the gas passage in C¹, the lugs or parts B¹ will further uncover the air-inlets H in such a manner that the air supply will be regulated in exactly the same proportion as the gas supply. It is claimed that this will obviate the firing back of the flame as with Bunsen burners of ordinary construction when the supply of gas is reduced.

Globes for Gas-Lights.—Gardner, D. R., of Glasgow. No. 20,248; Dec. 17, 1889. [6d.]

The patentee proposes to contract the openings in ordinary gas-globes (especially the outlet) in a variety of ways, with a variety of materials, but by preference doing so by means of a cover with a moveable damper, laid on the top of the globe, so as to retard the current of air, regulate its quantity, and accumulate and increase the heat given off by the flame—all three, acting individually or combined, increasing (according to the patentee) the illuminating power of the gas. The same cover acts as a reflector. It is made of asbestos with mica or talc as non-conductors between the asbestos and the gas-globes when the heat is great.

APPLICATIONS FOR LETTERS PATENT.

4574.—Kaselowsky, E., "Improvements in gas and petrol motors." March 24.

4598.—Gray, W., "Improvements in the manufacture of gas." March 24.

4622.—Greene, F., and Varley, F. H., "Improvements in photometers." March 25.

4655.—Meydenbauer, A., "Improvements in engines operated by gas, petroleum, benzene, and the like." March 25.

4698.—Mayhew, C. J., "An improved fluid motor pump, or meter, with variable adjustable capacities." March 25.

4737.—Middlebrook, C., "An apparatus for receiving coin or an equivalent, and supplying gas in exchange when combined with a gas-meter." March 26.

4776.—Donkin, E. B., and Hargraves, R., "Improvements in gas-valves." March 27.

4823.—Otto, N. A., "Improvements in gas and oil motor engines." March 27.

4826.—Lewes, V. B., "Improved method of, and apparatus for, preventing spontaneous ignition of coal cargoes, and indicating rise of temperature in such cargoes." March 27.

4928.—The Manchester Oxygen Company, Limited, and Jackson, W. M., "Improvements in the mode of using compressed gases for illuminating purposes." March 29.

4969.—Scotson, W., "Gas and air reversing valve for regenerative furnaces." March 31.

4977.—Albon, F., "Improvements in gas cooking-stoves." March 31.

5005.—Baxter, S., "Improvements in gas-engines." A communication from L. J. R. Holst. March 31.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Age of Candles a Factor in Photometry.

Sir,—Whilst perusing Mr. W. J. Dibdin's excellent book on "Practical Photometry," it occurred to me that the question of gas-testing candles was scarcely exhausted; and with the hope that my experience may be worth recording in the Journal, I write this letter.

Having a large stock of gas-testing candles here when I first came, I thought that they should be worked out before a fresh supply was ordered; and as soon as the new candles arrived (before the old stock was used up), experiments were at once instituted in order to ascertain whether or not the abnormally high returns on the Evans photometer were correct. The gas supply to the photometer-room is derived from a special service laid on to a pressure-register, and travels but a short distance from the 18-inch governor. The holder was not changed during any of the experiments, so as to avoid any chance of error from that source. It will be seen, from the figures I enclose, that the apparently high power of the gas dropped at once when the new candles were employed. This only confirmed my suspicions, and led me to infer that the candles had suffered from being kept so long (in a dry place); it being nearly eight years since they left the makers' hands! There is no mention of the age of candles in the Referees' Instructions. The photometer is an Evans closed-in pattern; and the usual method of testing employed is that given by the Referees.

In Mr. Dibdin's book, on page 92, I read: "While candles are no doubt unsatisfactory as a standard, they are not, when properly made and used, so bad as many of the published results have caused them to appear." Again, on page 122, I read: "The day cannot be far distant when a worthy substitute for the discredited candles will be found; and then those who deem them an excuse for present neglect will never recover their lost ground." Taking these two passages together, one is apt to be more distrustful than ever of candles as a standard for testing gas; and my only consolation lies in the probability that these two sentences were written at different times, with some long interval between, and that the writer must have suffered disappointment from the use of unsatisfactory candles when the words last quoted were penned.

I feel sure that the adoption of a perfectly reliable means of testing gas in a few minutes, will be hailed with the greatest satisfaction by many gas engineers who, like myself, are their own gas examiners. Till then we must content ourselves with the standard means of testing, which takes an hour each time.

T. S. Cleminshaw.

Launceston (Tasmania), Feb. 14, 1890.

[Enclosure.]

Results of Photometrical Testings.

Date, 1889.	Uncorrected. 1st Test.	Uncorrected. 2nd Test.	Uncorrected. 3rd Test.	Correct Average of Three Tests.	Rate of Average Consumption of Candles.	Remarks.
	Candles	Candles	Candles	Candles	Grains	
Friday, May 10	19·76	19·95	..	20·13	41·75	Old candles
Saturday ,, 11*	19·51	19·77	20·53	20·22	41·10	Old ,,
,, ,, 11*	18·19	18·12	17·55	18·22	40·10	New ,,
Sunday ,, 12	17·72	17·79	17·65	17·72	40·50	New ,,
,, ,, 12	18·60	18·05	18·87	18·51	39·60	Old ,,
Thursday ,, 16	20·47	20·26	19·47	20·00	40·30	Old ,,
,, ,, 16	18·78	18·77	18·49	18·31	39·60	New ,,

* On this day the gas was taken from the experimental holder; on the other occasions, from the street main.

P.S.—It is sometimes claimed as a point against the Evans closed-in photometer that the readings show a perceptible rise towards the third testing. I append the following tests (actual observations) to show that the difference, in my experience at least, is not so very great as could be imagined.—T. S. C.

Candles.		Candles.		Candles.
18·38	..	18·17	..	18·17
19·38	..	19·85	..	19·57
19·18	..	19·39	..	19·08
18·98	..	18·98	..	18·75
17·60	..	18·32	..	18·05
18·18	..	18·76	..	18·81
18·84	..	18·66	..	18·82
18·50	..	18·27	..	18·54
18·09	..	18·04	..	18·04

The Explosive Point of Oxygenated Oil Gas.

Sir,—Whilst thanking you for the fair tone of the article on Tatham gas published in your last issue (p. 587), I should like to call attention to one statement which is a little ambiguous, and may therefore be misread. You say: "The exact proportion of oxygen in a gaseous mixture to give the best effect in the photometer, depends upon the original richness of the hydrocarbon, and may vary from 2½ per cent. with ordinary coal gas to 20 per cent. with the richest gas procurable by retorting petroleum. From three to four times this quantity of oxygen might be added to the hydrocarbon gas, however, before the explosion point would be approached; and long before this limit of safety had been reached, the illuminating power of the mixture would be seriously affected." I find that some of your readers have understood this to mean that a mixture *containing* 80 per cent. of oxygen and 20 per cent. of oil gas is non-explosive, instead of a mixture of oil gas with 80 per cent. of its volume of oxygen. With rich petroleum oil gases, the explosive point is reached when the mixture consists of from 50 to 60 per cent. of oxygen and from 40 to 50 per cent. of oil gas.

I should also add that ordinary 16-candle coal gas would not stand the addition of 2½ per cent. of oxygen without loss of illuminating power, though a rich coal gas would.

Leonard T. Thorne.

Brin's Oxygen Company, Limited, Victoria Street, Westminster, S.W., April 3, 1890.

The Warrington Corporation and the Water-Works.

SIR,—Permit me to say that the editorial foot-note to my letter of the 21st inst. (*ante*, p. 549) is no answer to my observations.

You are quite right as to Mr. Monks stating that "the Sub-Committee had said nothing about a sum of £2933;" but your original assertion was to the effect that it was alleged "that a sum of nearly £3000 had been entirely omitted from the calculations"—a very different matter, surely. Now, the report of the Sub-Committee was referred to me by the General Purposes Committee; one of their objects in taking this course being, no doubt, to avoid the risk of error. By reference to page 3 of my report, you will find that the sum in question is duly dealt with. Mr. Monks had a copy of my report, and publicly referred to it on the 21st of February—twelve days before he made the remark as to the Sub-Committee. He was hardly, therefore, in a position to assert that the amount referred to had been "entirely omitted from the calculations." He did not, in fact, do so; and I repeat that the paragraph published by you gave the first intimation of any such allegation having been made.

You go on to say: "This" (the sum of £2933) "exactly represents the amounts appearing in the last balance-sheet of the Company as lying at the bankers to the credit of capital account." Had your object been to express what it does *not* represent, you could hardly have got nearer the mark; for, if you will take the trouble to again look at the accounts, you will find that the sum in question is not shown as *lying at the bankers*, but as *owing to them*.

I have no fault to find with your statement that I myself report that there is a *risk* of a charge upon the rates of 3½d. in the pound, except that you do not qualify the expression as I did. But your original remark was: "It is clear that the effect of the purchase will be to add a sum which . . . *is certain to be at least* 3½*d.* in the pound to the local rates;" and this was the assertion I described as fallacious. It is hardly necessary for me to point out the difference between a risk and a certainty.

Warrington, March 29, 1890. J. L. TUNSTALL.

[Again, Mr. Tunstall's last point appears the most important. We can only repeat that it has been continually stated, and is even now not denied, that one effect of the purchase will be to increase the local rates. The amount of this increase will depend, as we understand, on the course which Parliament may take as to the sinking fund. Mr. Tunstall says the risk is only 3½d; but others who favour the purchase have, as we pointed out on a former occasion, taken a less optimist view of the situation. With regard to the other matters, we see no reason to modify our former expressions, except, of course, to admit that Mr. Tunstall is correct in his statement respecting the sum of £2933. He appears to entertain the opinion that we had in some way cast a reflection upon the value of his report. This is an error. It is really a most careful and valuable exposition of the position of the Water Company as disclosed in the last published balance-sheet. But it does not cover the whole ground. As we originally suggested, the Corporation ought to have a far-reaching inquiry into the value of the property they desire to purchase. This they now intend to have; and the investigations will not, we presume, be confined to the accounts.—ED. J.G.L.]

Liverpool Corporation Water Affairs.—At the monthly meeting of the Liverpool City Council last Wednesday, the Town Clerk read a letter from the Board of Trade enclosing a memorial from the Montgomery County Council and a letter from the Clerk of the Peace for Montgomeryshire, suggesting a periodical inspection of the Vyrnwy dam and reservoirs in the counties of Salop and Montgomery connected with the Vyrnwy water-works, by an independent thoroughly skilled engineer of the highest standing. In their draft reply the Water Committee submitted that they ought not to be called upon to incur expense in connection with any such inspection as had been suggested; the works having been so constructed as to provide an abundant margin of safety. The Council approved of this reply. At a later stage of the proceedings, Dr. Marsh moved a recommendation of the Water Committee that the appointment of Mr. Alexander Duncanson as Deputy Water Engineer be continued at the salary of £500 a year, and that the Committee be authorized to relieve him of such portion of his present duties as they should see fit. Alderman Radcliffe having seconded the motion, Mr. Paull suggested that the words "for one year only" should be added. This was supported by Mr. Watts; and the addition was accepted by Dr. Marsh on behalf of the Committee. The recommendation, as amended, was adopted.

The Water Supply of Skipton.—Mr. F. E. Atkinson, the Medical Officer of Health for the Craven Combined Sanitary Authorities, in his annual report to the Skipton Local Board of Health, makes some special observations as to the water supply and the general sanitary condition of the town. Skipton, he says, is supplied by gravitation from Whinny Gill reservoir on Short Bank, as well as from three old reservoirs of small capacity; but the latter by reason of their lower elevation, can only supply the older portions of the town. In consequence of the insufficiency of the supply experienced during late years and the rapidly increasing population and growing needs of the town, the Local Board have for some time been considering the provision of a supplementary supply; and with this object in view they consulted Mr. G. H. Hill, C.E., of Manchester. This gentleman reported upon several alternative schemes, but recommended the adoption of a plan which, with the present supply, would provide water for double the existing population. This would entail the construction of a reservoir at Skibeden of a capacity of 80 million gallons, to collect water from an area of 295 acres. This more comprehensive scheme met with the approval of the Board, provided that the results of the trial borehole tests were satisfactory. Eleven of these have been sunk, varying in depth from 10 feet to 32 feet; and the Board are now waiting for a report from the Engineer upon the results.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The House sat on Monday and Tuesday only last week; adjourning on the latter day, for the Easter Holidays, till the 14th inst. The following further progress was made with Private Bills:—The Baildon Water Bill and the Birkenhead Corporation Bill were read a second time, and committed; the Gravesend and Milton Gas Bill, the Huddersfield Corporation Water Bill, and the Wessenden Reservoir Bill were reported. The two last-named Bills are not to be proceeded with. The Canterbury Gas and Water Bill was read the third time, and passed.

HOUSE OF COMMONS COMMITTEES.

Wednesday, March 19.

(*Before the Right Hon.* JAMES LOWTHER, *Chairman; the Hon.* G. R. VERNON, *Colonel* GOURLEY, *and Mr.* L. LYELL.)

DERBY GAS BILL.

This Bill—the object of which is to authorize the Derby Gaslight Company to acquire additional land, construct new works, lay down two short lines of tramways, and raise additional capital—came to-day before a Select Committee, constituted as above.

Mr. LITTLER, Q.C., Mr. PEMBROKE STEPHENS, Q.C., and Mr. J. D. FITZGERALD appeared for the promoters; Mr. PEMBER, Q.C., Mr. LEDGARD, and Mr. RICKARDS for the Derby Corporation.

Mr. LITTLER, in his opening statement, referred in the first place to the growth of the population in the Company's area of supply, and to the large expansion of their business. The Company, he said, were incorporated as far back as 1820, and then had the modest capital of £10,000—the population which they sought to supply being one of 17,400 people. In 1841 another Act was passed, repealing the former one, giving an additional capital of £22,500, and enabling them to supply 21 adjoining parishes. In 1852 their powers were increased to £60,000 share capital, and £20,000 on loans. In 1871 the Company made a further application to Parliament; and again in 1876, when they obtained power to raise £140,000 in all, with borrowing power of £35,000, or one-fourth of the capital. At the present time the population was estimated at above 100,000; while in the additional adjoining townships supplied by the Company, there was a population of nearly 50,000. It was tolerably clear that by this time the powers of the Company must be quite exhausted. Counsel proceeded to describe the objects of the Bill. The Company wanted to acquire more land; and to construct a couple of short lines of what were called railways, but which in reality were nothing more nor less than tramways. At the present time there was not an inch of available land for carrying out extensions at the works at Litchurch. The Company had spent from £160,000 to £170,000 on the works; and it would be almost impossible to move them. The piece of land which they proposed to acquire was of such dimensions that there would be no necessity for them purchasing further land for the erection of works for a very long time. In round figures, the cost of the land, with the necessary diversions and tramways, would be about £34,000. The Company also sought power to raise additional capital to a considerable amount—viz., £160,000. This no doubt was a large sum; but he thought he should succeed in satisfying the Committee, from the evidence of Mr. T. Hawksley, who throughout the life of the Company and his own professional career had acted as their adviser, that this amount would be required during the next 15 years. There were provisions in the Bill that would enable the stock when issued to be sold by auction; and the dividend was to be 5 per cent. on the ordinary capital, and 5 per cent. on the preference capital. He must confess that to himself this appeared to be an extremely simple Bill. The Corporation of Derby, however, had been pleased to think otherwise. Among other things, in their petition, they objected to the amount of the capital expenditure of the Company, and asked for a strict inquiry into the past and present management of the undertaking. Mr. Hawksley would be prepared to assist in that strict inquiry. Complaint was also made of deficiency in the illuminating power of the gas; but if there were anything in that, the Corporation ought to have looked more closely after the Company. But the charge was not true; the illuminating power of the gas being about 17 candles. The Corporation also wanted to have some limitation of the price for gas inserted in the Bill, and complained that the Company had hitherto been able to charge what they liked. The charge at present was 2s. 5d.; and at that rate he thought the Company might be trusted to continue to act fairly in the future. The petition then complained that "the Company have for many years paid their full maximum dividends, and in one year carried so much as £10,000 to their reserve fund; and it is submitted that, with due economy on the part of the Company, the price now charged for gas might be very considerably reduced, and the Company yet be able to pay their full dividends." All he could say was that this was not true. If it were, they could have brought the Company to book before the Recorder; and in failing to do so, they had been singularly negligent. The petitioners also submitted "that provision should be made for enabling your petitioners to purchase, and for requiring the Company to sell, the gas undertaking on fair terms and conditions." The Company, however, were not prepared to sell to gentlemen in whom they had no confidence to manage gas-works at all, much less such an undertaking as this one. He thought he was not going beyond the limits of allowable criticism when he said that a less reasonable petition than this it was difficult to conceive. He should at once proceed to call the evidence on which he relied to support the statements he had made.

Mr. *T. Hawksley* was the first witness called. He said he had advised the Company for 50 years or thereabouts. The population of Derby had multiplied five-fold; and since 1876, when the Company were last before Parliament, the consumption of gas had increased at the rate of 4½ per cent. per annum. At this rate it would double itself in about 16 years. Knowing what he did of Derby and these works, he did not think their powers would carry them over more than 15 or 16 years.

He thought the purchase of land proposed very reasonable. It was the only piece of land available for the extension of the gas-works.

The CHAIRMAN asked Mr. Littler to state what the cost of the land would be.

Mr. LITTLER: In round figures, the £34,000 will be expended as follows:—£20,714 in land and works, £7900 for the first railway and bridge, and £5300 for the second railway and bridge. The £20,000 odd for land and works will be laid out as follows:—Diversion of a road, £1752; communication road between the new and existing works, £3863; two lines of pipes, £7950; and land, £7146.

Witness, continuing, said that there was no extravagance in the capital they proposed to seek. The quality of the gas at present was very good—better than in London; and the price, too, was low.

In cross-examination, witness declined to admit that their power of production of gas under the proposed improvements would stand good, at the present ratio of increasing consumption, for 19 years. At the Company's Cavendish Street works, the amount of gas produced was about 700,000 cubic feet per day; and this was about the amount consumed. They did not carry gas from one works to the other, but distributed it from both works all over the town. The area of the two works was at present about 11 acres. At Cavendish Street, after the proposed enlargements were completed, the storeage capacity would be about 469,000 cubic feet. There were three gasholders at Litchurch, with a total storeage capacity of 1,611,000 cubic feet. The Cavendish Street works were incapable of further extensions; and it would not be prudent to enlarge the Litchurch works. At present 407 out of 616 retorts at Litchurch were in use. The capital expenditure of the Company was not larger than that of most provincial companies, considering all the circumstances. He would not admit that Derby was favourably situated for the production of gas, on account of its proximity to the coal-fields. They had to fetch coal on an average about 30 miles. The reason they had to purchase so much land was that the landowners would not sell a portion of it. Continuing, he said that there was no limitation in the Bill for a standard of illuminating power. The modern practice had not invariably been to insist on a minimum illuminating power of 16 candles. He was not aware that the Earl of Morley insisted on it in the House of Lords.

Mr. LITTLER: If it will make the Corporation happy and save time, we should be able to come to terms with them on this point. We shall be quite willing to give an illuminating power of 15 candles. If it were fixed at 15 candles, the Company would keep it at 16 candles.

Cross-examination resumed: With regard to the sale of the new stock by auction, witness stated that the present capitalized premiums amounted to £51,000; and no dividend had, of course, been paid on this sum.

Re-examined: It was anticipated that the new capital would be sold at about £30 above par. In anticipation of this, the Company were applying for less capital than would otherwise be necessary. Though the present price of gas was 2s. 5d. to small consumers, it was only 2s. to the large ones. The Corporation themselves only paid 2s. for the lighting of the streets.

Dr. *C. Meymott Tidy* was the next witness. He stated that the works were in excellent condition, both as regarded management and construction. He considered them the most perfect works to be seen in the country. The purification plant was ample, and was worked with great skill. Everything was being done to carry out the process of purification properly and carefully. The illuminating power of the gas averaged 17½ candles; and the sulphur present was about 17 grains per 100 cubic feet.

In cross-examination, witness said he did not consider 17·22 grains of sulphur per 100 feet too high. He was satisfied that there was really no harmful difference between 12 and 17 grains.

Thursday, March 20.

On the re-assembling of the Committee this morning,

Mr. LITTLER said that, having given evidence as to the necessity for the Bill, and having listened to the cross-examination of his witnesses, he had come to the conclusion that the main points of the opposition had reference to the quality of the gas and a maximum price. As the remainder of his witnesses would simply reduplicate the evidence he had already laid before the Committee, he proposed to close his case. The matters on which the opposition relied were simply subjects for additional clauses, if the Committee thought that there was anything in them.

Alderman *Bemrose*, ex-Mayor of Derby and Chairman of the Water-Works Committee, was the first witness called on behalf of the Corporation. He said that, in his opinion, the staff expenses of the Company were extravagant. He had examined their accounts, and made a calculation of the cost of management.

Mr. LITTLER pointed out that they were having new matter sprung upon them. Not a word about extravagant management had been suggested in the cross-examination.

Mr. RICKARDS said his learned friend complained of new matter being sprung upon him. But he had thought fit to rest the whole case of the promoters on the evidence of two expert witnesses. He (Mr. Rickards) fully expected that the Chairman or the Secretary, or some of their officials, would have been called, and that he would have had an opportunity of cross-examining them on these points. He had never known an instance of this kind, where the case for the promoters had rested solely upon expert witnesses.

Witness (continuing) said the local management expenses were £2273; and judging from his experience, the Corporation could get this work done for £1400. Derby was exceptionally well situated for the production of gas; being in the centre of a large coal-field, and a great railway centre.

Mr. *H. E. Jones*, M. Inst. C.E., Engineer of the Commercial Gas Company, said he had visited Derby, and made himself thoroughly acquainted with the circumstances of this inquiry. Actual permission to visit the works was refused him. As to the question of the illuminating power of the gas, the general practice in recent Acts was a standard of 15 candles. He considered that the producing power of the Company, as stated by their witnesses, was smaller than their capital would have led him to expect. Whilst the sale of gas had increased 31 per cent. in eleven years, the capital of the Company had increased 79 per cent. This was contrary to his general experience; and he could only account for it by the fact that they had burdened themselves with buildings and works considerably in excess of their present requirements. The price of gas had remained almost stationary; whereas in most other companies it had gone down. In 1883, it was 2s. 6d.; and at the present time it was 2s. 5d. The excessive expenditure had burdened the Company, and prevented them making reductions. The works were most favourably situated for the production of gas; being in the midst of a great coal-field. Very good gas coal was to be obtained at Staveley, which was only 28 miles away. The concern had not progressed at the rate it ought to have done, owing to the excessive capital. He was certainly of opinion that the producing power of the works should have been greater, considering the extent of the buildings. He thought the Litchurch works ought to be made capable of manufacturing 4 million cubic feet of gas per diem—that was, 1½ millions more than the present production. He was astonished at the small capacity of the gasholders at Derby. Even allowing for an 8 or 10 per cent. margin, there were a number of retorts that were not in use. He was of opinion that the works could be enlarged. The Company were faced with an expenditure of £34,000 at the outset in land and works; whereas they could sacrifice the smallest of the present holders, and build a new one in its place. The cost of a holder with a capacity of 750,000 cubic feet would be about £20,000.

Cross-examined, witness said he did not complain of the expenditure of £7000 for land, as he agreed that a gas company with an increasing business would do well to buy such a piece of land. He thought it would be better to buy it all at once than in two portions. His main objection to the purchase of the land was that it involved the crossing of a canal. He went on to contend that in Derby they could not look for a maintenance of the increase of 4½ per cent. in the consumption of gas. During the past eleven years, it had only increased 50 per cent; and he thought it would take 16 years to double the gas consumption.

Mr. *Howard Smith*, F.C.A., then gave evidence which went to show that the capital of the Company had grown in a greater proportion than the consumption of gas.

Friday, March 21.

On the resumption of the proceedings to-day,

Mr. PEMBER addressed the Committee in opposition to the Bill. He remarked that it could not be contended in this case that there was any serious reason for the proposed increase of capital. It could not be said, on the other hand, that the Corporation had been too jealous of the proceedings of the Company. If they had erred at all, it had been in the other direction. They had stood by and seen the capital increase until it had reached the enormous sum of a quarter of a million of money. What was the result? Why, if they trusted Mr. Jones—a gentleman of the greatest possible authority—the result of this had been that the capital stood 50 per cent. higher, judged by any available standard of comparison, than that of other companies in towns in a similar position. They were asking for capital that would be sufficient to enable them to double their existing output, and for land on which they could make three times the amount of their present production. Such an idea was perfectly preposterous. He contended that everything asked for by the Company was unnecessary. Mr Hawksley himself started by admitting (and not in cross-examination either) that, with more storeage room, they could make 3¼ million feet of gas per day; whereas his greatest sale had only been 2¼ millions. This was a margin of about a million cubic feet. Now the percentage of margin was 44 per cent. How soon would Mr. Hawksley exceed that? It would go on for eight years, as he himself admitted, but even that was on the supposition that he was going to have a compound increase of 4½ per cent. per annum during the period. He showed that 4½ per cent. per annum would double itself in 16 years; but how did he get that 4½ per cent. It was perfectly clear that Mr. Hawksley's calculation of the 4½ per cent. increase began in 1876; but that was an improper period to start from. Up to 1876 they had been a comparatively small concern. But in that year they very nearly doubled their capital; and it was easy to understand a concern making an enormous increase after the outlay of the new capital. During the last five years, there had been an increase of 18 per cent., or only 3½ per cent. per annum, instead of 4½; and this increase was not likely to be maintained. There was no necessity for the Bill now, and would not be for ten years. The matter ought to be left open; for long before the next ten years had elapsed the Corporation would have the concern in their own hands, in pursuance of the policy Parliament had followed during the past few years. In conclusion, he contended that the claim of the Company for the appreciation of their loan capital was altogether void. They had only to apply the funds in their hands for the enlargement of their storeage capacity, and then on their 11 acres they would be able to make as much gas as Derby would require for 20 years to come.

The room was then ordered to be cleared. After half-an-hour's consultation by the Committee, the public were re-admitted, when

The CHAIRMAN said: The Committee consider the preamble of the Bill is proved. Before we enter into clauses, it might perhaps be convenient that some consultation should take place among the parties. The Committee, subject, of course, to any consideration that may be placed before them, are disposed to consider that the capital asked for is excessive. We suggest a limitation of capital to £80,000, with borrowing powers of £20,000. They would also desire to ensure a provision maintaining a standard illuminating power of 15 candles. With regard to a maximum price, we should not dispose of the Bill without ensuring a maximum. If the parties would agree to the sliding scale, the Committee would be disposed to consider that as an alternative. The figure that would commend itself to us would be 3s. 6d.

Monday, March 24.

This morning the discussion of the clauses was proceeded with.

Mr. PEMBER brought up new clauses on behalf of the Corporation. Several of these were accepted without discussion—including one fixing the minimum illuminating power at 15 candles; another that

there should not be more than 20 grains of sulphur per 100 cubic feet of gas; and that the maximum price should be fixed at 3s. 6d. per 1000 cubic feet.

There was considerable discussion on the question of the necessity for an additional testing-place; and in the end, the Committee decided that a further one should be provided.

Mr. PEMBER said the next clause which he had to submit was one to invest the Corporation with power to give notice to purchase within six months after the passing of the Act.

Mr. LITTLER said he thought that had been withdrawn.

Mr. PEMBER said there was no such intention in the minds of his clients. He also reminded the Committee that the Company would have to come to Parliament again.

The CHAIRMAN: What would be the object of such a clause?

Mr. PEMBER: Well, you have heard the whole of the evidence; and you are in a position to say whether or not it would be a good thing.

The CHAIRMAN: In other words, you ask us to prejudge the result of a future inquiry. We cannot tie the hands of Parliament in the future.

The clause was withdrawn; and the Bill was then passed by the Committee.

Thursday, March 20.

(*Before Mr.* C. ACLAND, *Chairman; Mr.* M'INNES, *Captain* DAWNAY, *Captain* PENTON, *and Mr.* BONHAM-CARTER, *Referee.*)

PONTYPOOL GAS AND WATER BILL.

This Bill, promoted by the Pontypool Gas and Water Company for the extension of their limits of water supply, the construction of additional water-works, and the raising of further capital, came before the Committee to-day.

Mr. BALFOUR BROWNE, Q.C., and Mr. LEWIS COWARD represented the promoters. The Bill was opposed by the Local Boards of Abersychan, Pontypool, and Panteg, and certain millowners, for whom Mr. PEMBROKE STEPHENS, Q.C., Mr. WORSLEY TAYLOR, Mr. RAM, and Mr. CLIFFORD appeared.

Mr. BALFOUR BROWNE, in stating the case for the promoters, said the Company was formed in 1873, but the water-works were established in 1850. The quality of the water was excellent; but the quantity had in 1887 (a year of excessive drought) proved inadequate in certain high-level districts. It was therefore desirable that they should obtain an additional supply; and the Bill sought to attain this end by the appropriation of the Folly Springs. The promoters also asked to be allowed to extend their limits of supply, and to be permitted to charge additional rates for the supply of the high-level district. The average charge per house in the high-level district would be 9s. 6d. per annum, as against 8s. in the other districts.

Evidence was then given in support of the Bill.

Colonel *Hair*, Secretary and Manager of the Company, said that during the 35 years he had been connected with the concern, he had received very few complaints respecting the supply. The Company sought to increase their capital by £40,000, with borrowing powers for £10,000, believing that this sum would be necessary for carrying out the proposed extensions. With the additional source of supply, there would be no difficulty in providing both the old and the new districts with water. The filtration of the water was not defective. The Company objected to being bound to supply water for manufacturing purposes. The whole of the capital, with the exception of £3600, had been issued.

Cross-examined by Mr. WORSLEY TAYLOR: The Company had also unexhausted borrowing powers to the extent of £2500.

Friday, March 21.

This morning some evidence was first adduced as to the yield of the various springs from which the Company took their supply, and the quality of the water from the Folly Springs.

Mr. *T. Hawksley*, C.E., was afterwards examined. He stated that he made an inspection of the Pontypool Water-Works, and advised the present application. He explained the provisions of the Bill, and expressed the opinion that, if the works proposed were carried out, an adequate supply would be afforded to the extended limits of the Company's district. The total expenditure for the work would be about £24,927; the cost of the pumping-stations and apparatus being something like £6000. It was to meet the wants of the Aberyschan districts, from which complaints of insufficient supply had come, owing to many of the houses being above the gravitation line, that the Company were going to the expense of reconstructing the pumping-stations.

Witnesses were then called in support of the millowners' petition; and generally their evidence went to show that the proposals contained in the Bill would seriously affect the value of their property.

Monday, March 24.

Mr. *Cook*, the Surveyor to the Abersychan Local Board, this morning gave evidence as to the water supply of his district, which, he said, had always been short in the summer. Some remedy was absolutely necessary for the scarcity. The Local Board viewed the present scheme with some anxiety, since the Company, as far as their Cwmavon source was concerned, were only going to the same source as in 1873. In 1887, there was no overflow at all; and any estimate as to the supply in wet seasons could not be relied upon in dry times. The springs were not deep ones, and were not independent of rainfall. There had been a scarcity of supply year after year; but in 1887 there was absolutely no surplus. Looking to the facts, he considered that the Company should not be relieved from their obligation to construct the storage reservoir at Nant-y-Mailor which was authorized in 1873.

Evidence was next taken in support of the opposition of the Pontypool Local Board; the witnesses being Mr. *D. H. W. Powell*, the Board's Surveyor, Mr. *Williams*, the Chairman, and Mr. *Chapman*.

In the result, the Committee decided that the preamble of the Bill was proved. With reference to the question of priority of one district over another, they were of opinion that there should be none.

MISCELLANEOUS NEWS.

THE DIRECTORS OF THE SOUTH METROPOLITAN GAS COMPANY AND THEIR WORKMEN.

Presentations at the East Greenwich and Bankside Stations.

Yesterday week, the Chairman of the South Metropolitan Gas Company (Mr. George Livesey) and Mr. Robert Morton, with the Chief Engineer (Mr. Frank Livesey) and the Secretary (Mr. Frank Bush) visited the East Greenwich station of the Company to receive from the men, on behalf of the Board, an address, which was prettily embellished and framed in oak, with gilt mounting. The Engineer of the works (Mr. J. Tysoe), in making the presentation for the employees, said it somewhat differed from previous similar acknowledgments in the fact that a great number of the subscribers were men who forsook the Company at one time, but had seen the error of their ways, and had returned. He read the address, which was as follows:—

To George Livesey, Esq., and the Directors of the South Metropolitan Gas Company.

Gentlemen,—We, your loyal servants, old and new, of the East Greenwich station, desire to express our sincere approval and appreciation of your actions during the late strike, and to congratulate you on the success of the profit-sharing system, which has done so much to establish unity of interests and good feeling between employers and employed.

We thank you for the generous way you have dealt with us, for the many tokens of kindly regard that have emanated from your united counsels, for the many encouragements we have had from you to self-help and self-reliance and self-improvement, and for your generosity which enables us once a year to visit the homes of our childhood and friends of old. These actions have prompted us to record in this address our gratitude towards you.

Wishing you each a long life and happiness, and continued success to the South Metropolitan Gas Company,

We are, Gentlemen, your obedient Servants.

Signed, on behalf of the Workmen, CHARLES ELBOURN.

One of the workmen, Mr. Austin, briefly addressed the Chairman observing that he believed the words contained in the address were a genuine expression of the feelings of the men towards the Directors. The Chairman heartily thanked the men for their handsome address; and then proceeded to remark that he called these meetings between the men and the Directors meetings of the true gas workers' union. What they wanted to see was a union between masters and men—a union in which they were all pulling and working together for their mutual benefit. That was what he considered to be a true gas workers' union—not such a union as was started, and was now in existence for the sole purpose of fighting, as was stated by the leaders Thorne and Hutchins. That Union spoke of the employer as "the enemy;" but it would be a bad day for both masters and men if they were to assume an antagonistic position one towards another. He was glad to hear that a number of the old hands, who were misled, had returned again, and were working on amicable terms with the loyal and new men. In conclusion, he said that if they all endeavoured to honestly do their duty, they might look forward to a continuance of their present happy relations for many years to come.

The men at the Bankside station, who were about the first to settle down and get into working order at the time of the strike, have also presented the Directors with an address, which was framed and ornamented in a neat and pleasing style. This was formally handed over to the Chairman of the Company, before the men at the station, last Wednesday morning, by Mr. John Somerville, the Engineer. The following is the text of the address:—

To the Chairman and Directors of the South Metropolitan Gas Company.

Gentlemen,—The employees at your Bankside station, approaching you with all respect, desire, by the means of this address, to place permanently on record the expression of their cordial satisfaction at the successful termination of the late contest, whereby you so fully vindicated the right of freedom of contract between master and man, and which they feel is deserving of ever-to-be-remembered gratitude.

The old hands remaining at this station had long since had cause to appreciate the benefits which you had conferred upon them from time to time; and it was a source of great regret to them that you should have been compelled to embark in a struggle (now happily ended), when, as they felt, the bonus scheme, wisely introduced by your Chairman, was so greatly to their advantage. They, together with the new hands, are anxious to express their complete approval of the provision made for their individual comfort during the troublesome period, and for which they offer you most sincere thanks, and furthermore all beg that you will kindly accept this acknowledgment at their hands, and therewith the assurance of their earnest intention to appreciate the interest you have shown for them by performing their several duties to the utmost of their power.

Signed, on behalf of the men,

WILLIAM SPERRING, Foreman.

In making the presentation, Mr. Somerville pointed out that the men were not following the lead of the other stations, as he believed they were the first to suggest this action. In thanking the men, the Chairman observed that the address was accepted by him as though there had been no addresses from other works; and he took it as quite an independent expression of the goodwill of the employees at that station towards the Directors. He impressed upon the men that, if they wished to see the concern prosper, in which prosperity they with the shareholders and consumers would join, there must be unity between them and the Directors. With regard to the demand which the Gas Workers' Union made at the commencement of the recent strike, that the loyal men should be removed from the works, he declared that sooner than the Directors would have yielded to such an unjust demand, the gas lighting in South London should all have gone out. The stokers who left the Company's employ were very much misled; and believed they would not have been able to go on without them. The new hands had shown the old stokers that gas making was not very difficult to learn, and that if they were so foolish as to leave good work and pay, and he thought he might add, good employers, there were plenty of men ready to step in to

their places. He had on this occasion a further pleasing duty to perform, and that was to present, on behalf of the men, a marble timepiece to Mr. Somerville, as a token of their respect. It must be very gratifying to his old friend to receive, as it was for him (the Chairman) to hand him this gift. He had known Mr. Somerville for a great many years; and he thought the men had rightly estimated his character. Mr. Somerville sincerely thanked the men; remarking that he had not the slightest idea they were going to favour him in this way. It indicated the kindly feeling which existed, and he trusted would continue to exist, between him and the men. He was pleased to inform the Chairman that they had now at that station a good number of first-class men, who were both physically and morally better than the old men who had left them. The men before separating heartily thanked the Chairman for the service he had rendered them in making the presentation to Mr. Somerville on their behalf.

PRESENTATION TO MR. CHARLES GANDON.

On Friday, the 28th ult., the foremen and workmen employed by the Crystal Palace District Gas Company presented to Mr. Charles Gandon, M. Inst. C.E., the Engineer and Manager, a testimonial expressive of their regard for him. It consisted of a beautiful set of three table ornaments in solid silver, designed after Benvenuto Cellini, and bore the following inscription:—"Presented to Charles Gandon, Esq., M. Inst. C.E., by the Foremen and Workmen of the Crystal Palace District Gas Company, as a token of respect and esteem, and as a testimony to the admirable way in which he has carried out his duties in connection with the workmen of the Company.—Lower Sydenham, March 28th, 1890." About 400 of the workmen assembled to take part in the ceremony; and, it being Board day, the Directors in attendance joined the meeting.

Mr. Magnus Ohren, Assoc. M. Inst. C.E. (the Secretary of the Company), made the presentation. Addressing Mr. Gandon, he said he had been asked by the men to present to him that day a testimonial of their esteem and regard. They highly appreciated the very kindly and generous manner in which he had always treated them, and supported them in their social gatherings. They were specially impressed with the good feeling which had prompted him a short time ago to invite them all to the Crystal Palace, where two pleasant evenings were spent. The men were pleased to see the officers gathered round the Engineer on those occasions; showing, as it did, the high estimation in which he was held. The officers would, indeed, have been glad to join the workmen in their testimonial; but he (Mr. Ohren) was of opinion that the gift should come entirely from the men, as he was sure this would be more acceptable to Mr. Gandon, as it would show their appreciation of his conduct towards them during the time of the recent strike, which they felt might have had unfortunate consequences for them, as it had to the men employed by a neighbouring Company, had his dealing with them been less conciliatory than it was. This feeling had led to the spontaneous movement which had resulted in the testimonial. He (Mr. Ohren) reminded Mr. Gandon that it had always been the desire of the Directors to act justly and kindly towards the men; and he was bound to acknowledge that their Engineer had been only too glad to carry out their desires. For his own part, he could truthfully say that the friendship which commenced the first day they met, had continued till that moment; and he sincerely hoped Mr. Gandon would live for many years to look upon the beautiful gift which he, on behalf of the foremen and workmen, then presented to him.

Mr. Gandon, in reply, said that with the valuable present before him he thought he might safely address those present as "friends." He could not find words to express the mixed feelings of pleasure and gratitude he experienced at receiving the highly flattering testimonial of their esteem; he was, however, unable to imagine what he had done to deserve it. It was true that it had always been his aim to do all in his power to promote the well-being of the Company's employees, but in this he had only been following the footsteps of those who had preceded him. He must, however, remind them that, however sincerely he desired to promote their interests, there were also others for which it was his duty to care. The proprietor of an ordinary trading concern had only to consider himself and his employees; but the manager of a gas undertaking had, besides his own interests, threefold obligations—viz., his duty to his Directors, the interests of the shareholders, and the fair treatment of all employed. He might, in fact, also add a fourth, and say that they were one and all bound to consider the consumers. Happily, he believed that all these interests were identical, and that they would one and all best consult their own by endeavouring to satisfy the consumers. In order to do this, they must try to produce and sell their gas as cheaply as possible. It was urged by some that the great object to be attained by shortening the hours of labour was that employment would thereby be provided for more hands. Well, this might to a certain extent be the case; but he would remind them that there was another side to the question, and if such restriction of working time increased the cost of the article produced, the consumption would fall off, and then what would become of the extra hands to be employed? He did not intend to say much about unionism. But he should like just to say he thought it was a very good thing if it was so managed as to safeguard the true interests of its members; but when it was so directed as to disorganize trade and interfere with the good feeling that should exist between employers and employed, it became an abuse, and meant disaster to all concerned. Again alluding, in conclusion, to the elegant testimonial presented to him, he said he should prize and feel proud of it for the rest of his life, not only for its intrinsic value, which was considerable, but more especially because it gave him the assurance that that sentiment of mutual good feeling and esteem to which he had referred existed among them to no small extent; and he assured them it would always be his sincere endeavour to maintain it.

Mr. F. Lane Linging (Chairman of the Company), addressing the men, said he looked upon the friendly spirit displayed by them as a happy augury for the future. He would have been glad to take this opportunity of saying a few words to them; but, as he was suffering from a cold and loss of voice, he would ask his friend and co-Director, Mr. G. Livesey, to do this for him.

Mr. Livesey, who was most cordially received, expressed regret that the Chairman was unable to address them. He said it gave the Directors great pleasure to be present on such an interesting occasion. He considered it to be a meeting of a Gas Workers' Union in the best and truest sense; such a Union as one of the workmen of the South Metropolitan Company said, at a meeting which took place in November last, he wished to see—a union of employers and employed. Having referred to the disastrous consequences which had resulted to the large number of men who left the service of his Company at the time of the late strike, he said the men of the Crystal Palace Gas Company had acted more sensibly, and had shown proof of it by giving to Mr. Gandon the handsome present before them. It was a great pleasure to the Directors to find their workmen entertaining such a kindly feeling towards their officers; and in this he included their old friend Mr. Ohren. Instead of regarding their employers as "enemies," as they were described in the organ of the Gas Workers' Union, they had shown that they considered Mr. Gandon their friend; and in this they were right. Mr. Gandon had always been most anxious to promote the men's welfare; and the Directors had been ever ready to support his efforts. They had, however, not only to do their duty to the workmen, but also to the shareholders and the general public. All the men in the Company's employ had a share in the responsibility of keeping up the supply of gas; and if they or the Directors were to neglect their duty in this respect, serious results would follow. But the fact that the men had assembled there to make the presentation was good evidence that they intended to be faithful in the performance of their duty to the Company and to the public. In conclusion, he expressed a hope on the part of the Directors, that the happy relations that now existed between the men and the officers of the Company might never be broken; and that a long career of mutual prosperity might be in store for the Company and for all their workmen.

The Testimonial Committee having been thanked for their labours, and complimented upon their selection for the testimonial, the proceedings (which were enlivened by music given by the workmen's band) closed with cheers for the Directors, the Secretary, and the Engineer.

Sale of Shares.—At a sale by auction of miscellaneous shares at Pudsey, last Tuesday, ten £10 shares in the *Kildwick Gas Company* realized £12 2s. 6d. each, and ten similar shares £12 8s. £60 worth of "B" stock in the *Drighlington and Gildersome Gas Company* sold for £96 5s. Seven new shares of £10 each (£9 paid up) in the same concern were disposed of in one lot for £83 5s.

Damages against the Belfast Water Commissioners.—At the County of Antrim Assizes last Thursday week, Patrick Comerford brought an action for £150 damages against the Belfast Water Commissioners for injuries sustained on Dec. 4 last, by reason, as alleged, of the negligence of the defendants. From the evidence adduced, it appeared that the plaintiff was driving a pony and trap along a road where defendants' workmen had opened a trench, which, it was averred, had been improperly filled up by them, and that the pony sank into the ground and stumbled, throwing plaintiff out, and causing such injuries that he was unable to pursue his vocation for about a month. The jury returned a verdict for the plaintiff with £50 damages. On behalf of the Commissioners, an arrest of judgment until the fifth day of term was asked for, on the ground that the verdict was against the weight of evidence. The Court decided that defendants could take what course they liked.

The Lighting of the Victoria Courts, Birmingham.—At the meeting of the Birmingham City Council last Tuesday, the Mayor (Mr. Clayton) proposed that the General Purposes Committee be authorized to provide for the lighting of the Assize Courts (known as the "Victoria" Courts) by electricity, by the Birmingham Electric Supply Company, at an estimated cost not exceeding £2000. Sir Thomas Martineau seconded the motion. In the course of the discussion which followed, some of the speakers thought that the Gas Committee ought to be given an opportunity of showing what they could do in the way of efficiently lighting the Courts by gas. Other members regarded the proposed extension as unnecessary; seeing that the Courts were used very little. The Chairman of the Gas Committee (Alderman Pollack) pointed out that the initial expense for gas lighting and ventilation would be lower than the initial expense for electric lighting and ventilation; but he did think that in a city like Birmingham they ought to give the new light an opportunity of making its way. He had urged the Electric Lighting Sub-Committee to take steps to see whether the Corporation should not be the electric lighting authority. The resolution was carried.

The London County Council and the Water Supply.—At the meeting of the London County Council last Tuesday, Mr. J. Beal presented the report of the Special Committee on Water Supply and Markets, recommending the Council to introduce into Parliament during the present session a Bill for the purpose of suspending the powers of the Water Companies to increase their charges for water consequent upon any increase that may be made in the assessment of property in the county of London by the quinquennial re-valuations, to which reference was made last week. In moving the adoption of the report, he said the water question was one which had been ripe for settlement for some 35 or 40 years, and it was time the Government did something in the matter. The Water Companies charged on the quinquennial assessment, and the rise in value on two of these occasions had been from £24,000,000 to £32,000,000. This meant that the Companies now charged on £3,000,000 more, without having expended any additional capital. Sir T. Farrer agreed with the last speaker's remarks; observing that they ought to make the loudest protest they could against the present system, and cast upon Parliament the responsibility of not attending to the interests of the ratepayers of London. The recommendation of the Committee was unanimously adopted.

COMMERCIAL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Cannon Street Hotel, E.C., last Thursday—Mr. J. B. GILL in the chair.

The SECRETARY (Mr. H. D. Ellis) having read the notice convening the meeting,

The CHAIRMAN moved a resolution expressing the regret of the proprietors at the death of Mr. T. W. Ratcliffe (the late Chairman of the Company), recording the sense of the loss they had thus sustained, and expressing their condolence with Mrs. Ratcliff and the family in their bereavement. The Chairman reminded them that the deceased gentleman was connected with the Company for many years, and the Directors regretted the loss of a good friend and an able colleague.

The DEPUTY-CHAIRMAN (Mr. R. Jones) seconded the motion, which was supported by

Mr. COLEMAN (a shareholder), and carried unanimously.

The SECRETARY then read the minutes of the last meeting; and the report and accounts, which were given in the JOURNAL last week, were presented.

The CHAIRMAN proposed that the report and accounts be received, adopted, and entered on the minutes. After alluding to his own appointment as Chairman of the Company on the decease of Mr. Ratcliff, and the consequent election of Mr. Robert Jones as Deputy-Chairman, he expressed great satisfaction in the appointment of Sir J. C. R. Colomb, K.C.M.G., M.P., to fill the vacancy at the Board. Passing to the working of the half year, he stated that this period had been one of deep anxiety to the Directors. The great strike at the South Metropolitan Company's works was now a matter of history; and they knew as well as he did with what ability, promptitude, and fertility of resource Mr. Livesey had fought that great battle. He was quite sure that he interpreted the sentiments of the proprietors as well as of the Board when he said that they sincerely congratulated that gentleman on his most successful victory. The reason for their congratulating him was very simple, because it appeared to him that Mr. Livesey was fighting for what Englishmen had always considered to be one of their most special privileges—their liberty. Mr. Livesey was fighting for freedom of contract—for the right of the British workman to sell his labour in what market and at what price he chose. The shareholders could quite understand that with all this trouble going on not very far from the Company, the air was charged with a quantity of electricity, and there was a good deal of unrest among their men. In fact, but for the judgment and conciliatory demeanour—and at the same time perfect justice—with which their excellent Engineer had treated their men, they might have been plunged in a similar trouble. It was the proprietors' and the Directors' wish that every employee of the Company should have a fair day's wage for a fair day's work; and while they were perfectly straightforward in their dealings with their men, all they asked of them was to be loyal and true to the Company, and to give them a fair day's work. Turning to the accounts, he said he thought that, on the whole, they might congratulate themselves upon them. They had carbonized 3800 tons of coal more than they did in the corresponding period of the previous year, at an extra cost of £1834. The reduction in the price of the gas from 2s. 6d. to 2s. 4d. per 1000 cubic feet had cost them, in round figures, £5000; they had reduced the meter-rents greatly, which had cost them £480 (this measure having also been taken for the purpose of stimulating trade); and their extra wages, which was a very serious item indeed, had been no less than £6446. This made the total loss about £13,760. But, fortunately, tar had come to the rescue, though they had incurred a slight loss on coke; and so their loss had been reduced to £10,643. Last year they carried to the profit and loss account £57,134; but this year they could only add £46,391 to it. The increased sale of gas had been somewhat disappointing—only about 2 per cent.; and it did not compare very favourably with the big Company. They could, however, account for this to a certain extent by the dock strike, which took place in their midst. This entirely paralyzed trade for some time, and gave them a great amount of trouble and uneasiness as to their coal deliveries; and so far-reaching were these disputes between capital and labour, that the Company had been suffering from them up to the present time by a short supply of coal on their works. This, added to the increased cost of coal at the pit's mouth, had given their Engineer and themselves a great deal of anxiety. But he was very glad to think that, with the lengthening days, they were practically out of the trouble; and he hoped in the future they would be able to put by larger supplies to meet any similar difficulties. They had laid 795 yards of new mains, extended 705 yards of old mains, supplied 261 additional consumers, and 45 fresh lamps. He next came to an item in the accounts which gave him a good deal of pleasure. They had now 2622 stoves out at an increased rental of £57 for the six months; making a total of £490 received for the half year in rent of stoves. He always thought that in the matter of these stoves the gas companies were the pioneers of civilization. He could not imagine anything that could be better for the thrifty housewife than to have a good gas-stove. The gas was taken to the workman's home at 2s. 4d. per 1000 cubic feet; and he could hire a stove for a merely nominal sum. He saved considerably by this means in the amount of his food, as the waste was not nearly so much in cooking by a gas-stove as by an ordinary stove. The moment, too, that the fuel ceased to be wanted it could be put out of use. He thought it only required an extended knowledge of these facts for the Company's work in this direction to be greatly increased. He could not understand why it was that in London gas-stoves were not more popular. In the case of a foreign company of which he knew, they had 28,000 gas-stoves out on hire among workpeople. This was in France; and he could not understand why, in time, this French habit should not extend to our own people. The Directors did their best to stimulate the trade. Lately they had an exhibition at Bow, which had been a great success. The stoves had been exhibited, and a lady had given lessons in cookery. They hoped to have a similar exhibition shortly at Limehouse. He trusted that by this means they would be enabled to show an extension of business, because they could not expect their district to increase by "leaps and bounds," as in the case of their neighbours. Their own district lay in a ring-fence, as it were, and they must try and popularize gas by means of fittings and stoves. It appeared to him that they had nothing to fear from electricity; but they had a more potent enemy in their midst—viz., cheap oil. This was the enemy they had to overcome; and they could only do so by popularizing gas. He thought that the shareholders would agree with him that the accounts were very satisfactory; and if they were permitted to enjoy the revival of trade, if they were spared any further troubles with their workpeople, and if the coal owners in the North did not mulct them too severely in the contracts into which they must enter before long, he hoped six months hence to appear before them with another satisfactory statement of accounts.

The DEPUTY-CHAIRMAN seconded the motion, which was unanimously agreed to.

On the motion of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, the dividends recommended—at the rates of 13¾ per cent. per annum on the old stock, and of 10¾ per cent. per annum on the new stock—were approved.

Mr. H. L. HAMMACK next proposed, and Mr. W. G. BRADSHAW seconded, the re-election of the retiring Directors (Messrs. J. B. Gill, R. Jones, and F. Farnan); and the motion was agreed to. Subsequently Mr. J. Haigh was reappointed one of the Auditors.

On the motion of Mr. ENNIS, seconded by Mr. GOULD, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN acknowledged the compliment; and afterwards moved a vote of thanks to the Engineer, the Secretary, "and all who have well and faithfully served the Company in the past six months." He warmly recognized the services of the officials generally, and especially those of the Engineer and the Secretary.

The motion was unanimously agreed to.

The ENGINEER (Mr. H. E. Jones), in reply, observed that the extraordinary disturbance that had taken place outside gas altogether, coupled with the radical change in connection with the most important part of their labour staff, had led, naturally enough, to great excitement in the minds of all labourers connected with gas-works. In the midst of this, a struggle came on which every one deplored, which had been fought fairly, and had resulted in the triumph of the employers. While the struggle went on, they could well understand how much the uncertainty operated in the minds of the Company's servants. The men in the employ of the South Metropolitan Gas Company lost the pride which they most justly took previously in this honest labour; they took the advice of agitators, and forgot that Mr. Livesey had always been their best friend, and had done probably more for their class than any other employer of labour. He was glad to say that in their own case, even at the worst time—at the height of the crisis—when the output at their works was much reduced by the action of the agitators advising the men to give as little labour as they could to the Company, every one of their men responded to the appeal which he then made; and they enormously improved their output when he showed them that what they had been doing was likely to prove disadvantageous to the Company. He was glad to see that the reports received from all parts of the country showed that the men were returning to their old allegiance, and were learning that it was not the employers who were their enemies.

The SECRETARY also returned thanks; and the proceedings then terminated.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held yesterday week—Mr. EDWARD FOTTRELL in the chair.

The SECRETARY and MANAGER (Mr. W. F. Cotton) read the notice convening the meeting; and the Directors' report, a summary of which was given in the JOURNAL last week (p. 604), was taken as read.

The CHAIRMAN said the statement of accounts did not show such satisfactory results as it had been his good fortune to present to the shareholders for several half years; but exceptional causes had intervened, which resulted in a diminution of profits. The Directors, however, recommended for adoption the same dividend as before, although the payment of this would necessitate the withdrawal from the reserve fund of £3477 15s. 8d. The quantity of coal carbonized was in excess of that during the corresponding period of last year, although the gas made had been less. This in a measure, was to be accounted for by the disorganization of the employees at the works. The system of working in the retort-house was that of two relays of stokers; each batch attending to the retorts for twelve hours. The men brought this matter strongly before the Directors, and he confessed with some justice; so that, after giving the question every consideration, and to avoid a strike, the Board decided to change the shifts to eight hours—thus necessitating three relays of men in the 24 hours. The wages of the stokers remained as heretofore; but the additional relays of men, with additional wages to some of the other hands, would cause an increased outlay for labour of 50 per cent. in connection with the carbonizing department. If, however, the demand for gas improved, it would to some extent counteract this, as the expenses would not increase in the same ratio on the larger delivery. There was an improvement in the demand for, and price of, residual products compared with the corresponding period of the previous year, to the extent of nearly £900; and the Directors looked forward to further development in this department. It had become necessary, he continued, to expend some capital on sulphate works. They were obliged to take this part of the manufacture into their own hands, owing to the failure of the contractor to take delivery of the ammoniacal liquor They had therefore erected a manufactory of most improved construction for making sulphate of ammonia; and had fair reason to be satisfied with the results so far. On these works they had expended £1951 during the half year, which was charged to capital account. There was another charge to capital account—viz., £1821 for the purchase of the Mariners' Church. This building was long sought after by the Company; as it was situated, it might be said, inside the works. It was to be utilized for the engine-house and exhausters. The report

also stated that a sum of £1526 had been taken from the contingent fund to defray the expenses of the recent arbitration with the Corporation. This was a matter which required explanation; and although it was not by any means a pleasing subject to bring the Corporation prominently forward, nevertheless it was due to the shareholders that he should state the facts. The relations of the Corporation with the Company had not been of that friendly nature which should exist. Why he could not say, except it could be foreshadowed in a speech delivered on Sept. 2 last by Mr. Sexton, the late Lord Mayor. When giving a reason for expenditure by the Corporation for electric lighting, he stated: "The greater object was increasing the facilities for securing the gas undertaking on terms favourable to the citizens." Of course, the only meaning to be attached to this statement was a wish to deteriorate the value of the property of the Company. No doubt it would be within the shareholders' recollection that charges of a most serious nature were levelled against the Company in the Council; it being publicly stated that the accounts for gas used for public lighting were greatly in excess of what was supplied. On this and other grounds, including alleged deficiency in the illuminating power of the gas supplied, the payments of the Company's accounts were delayed, and deductions which could not be entertained put forward. In fact, 20 per cent. was taken off the Company's accounts, which was subsequently found to be unsustainable. The Directors, therefore, had no option but to institute legal proceedings; and in the result, the matters in dispute between the Corporation and the Company were referred by the Court to arbitration. He might mention that, previous to the institution of legal proceedings, the Company were willing, and offered on several occasions, to leave the matters in dispute to arbitration. The issue of the arbitration, he was happy to say, was favourable to the Company; and the first paragraph of the award (which he might paranthetically add was made by consent) read as follows:—"That the plaintiffs supplied to the defendants the quantity of gas in the statement of claim mentioned, and that they are entitled to be paid, in addition to the sum of £5000 already paid, the sum of £1826 3s. 3d., and that the defendants shall pay to the plaintiffs the costs of the action, not including the costs of reference." This effectually, and once for all, disposed of the charge brought against the Company. The arbitration agreed upon was of a most expensive character, involving not only large fees to arbitrators and counsel, but likewise the necessity of having the evidence of a large number of experts from the other side of the Channel. The costs, including both sides, would amount to about £3000. The Company's costs, which included an arbitration for a future supply for public lighting, were very large; and the Board considered it was not a payment properly chargeable to the half-year's revenue, and therefore debited the contingent account with the amount of £1526. The Company had been traduced by more than one member of the Corporation. Amongst other things, it was stated in the Council Chamber that the gas supplied to the testing-station was different in quality to that distributed in other parts of the city, insinuating that a special gas was made for the purpose, and that the Company supplied it through a small special main leading from the works to that station. The Company offered to show that this statement was void of foundation—that the two supplies to the testing-station were taken from the two large feeding mains to the city. They challenged the Corporation to prove their statement, and offered to open down to the mains and expose them to view in the presence of the City Engineer, or any engineer the Corporation might elect. That body subsequently appointed an engineer; the Company placed the works at his disposal for examination; and in his presence, and at his request, exposed the mains. Although that gentleman, in the presence of Alderman Perry, the High Sheriff, found that the mains and supply to the testing-station were exactly as stated by the Company, twelve months had elapsed, and no steps had been taken by the Committee of the Corporation, or anyone on their part, to withdraw the serious charge, or to remove the impression left on the minds of the members of the Corporation or the public that the Company were systematically defrauding the public. In a report, signed by Alderman Dillon, issued by the Special Gas Committee of the Corporation, and dated Oct. 3 last—the day after the arbitrators sat—they state that, when they attended before the arbitrators, they were invited by the Directors of the Gas Company to a conference, with a view to adjusting the matters in dispute in a friendly manner, if it were possible. This statement was entirely without foundation. No member of the Board, or anyone connected with the Company, either suggested or invited the Committee to a conference. When the conference was suggested on the part of the Corporation, not one of the Directors had arrived at Court—in fact, messengers had to be despatched for them. On their arrival, the members of the Corporation and the arbitrators were obliged to wait pending the decision of the Directors as to whether they would entertain the propositions or otherwise; the Directors were really wholly unprepared either for a conference or a compromise. Not so with the representatives of the Corporation, who evidently had it in view to seek for such a conference. No doubt the shareholders had noticed from time to time the reports published, he presumed, by direction of the Committee of the Corporation, purporting to be the results of tests made by their officer on the illuminating power of the gas. These reports were not only at variance with the results obtained by the Company's able expert, but likewise with those arrived at by Dr. Tichborne, the City Gas Examiner appointed by the Board of Trade. It was quite a common occurrence for the officer of the Corporation to report the gas 1 or 2 candles, and sometimes approaching 3 candles, below the results obtained by the other gentlemen referred to. The Engineers of the Company could not from the materials used produce gas of the quality stated in the published reports of the Corporation, unless they purposely destroyed them. However, the Company were in a position to prove that the illuminating power of the gas, with very rare exceptions, had been above the standard; and he (the Chairman) merely called attention to the subject, in order that the shareholders and the public might understand that the reports he had referred to were not to be depended on. With regard to electric lighting, the Chairman stated that, owing to new rules having come into operation by the Board of Trade, which required that all overhead wires should be insulated and of a larger size, the Board had for the present suspended the operation of lighting by electricity, as they feared the expense attending such change would be more than the demand for electric lighting would justify. As to the increase of 3d. in the price of gas, the Directors regretted they had been compelled to take this step. For the past fifteen years, no opportunity had been lost to reduce the price; and the reductions had been many. It was therefore with reluctance that, after so many years, they felt compelled to arrive at this conclusion. In addition to the largely increased expenditure for labour, nearly every article used in the manufacture of gas had advanced in price—cannel, in particular, to the extent of 9s. or 10s. per ton. He concluded by proposing the adoption of the report.

Mr. MAURICE BROOKS, D.L., seconded the motion, which was adopted without discussion.

The CHAIRMAN proposed that a dividend at the rate of 10½ per cent. per annum on the old shares, and 7½ per cent. per annum on the new shares, be declared.

Mr. MURPHY seconded the proposition, which was carried.

The retiring Directors and Auditor having been re-elected, votes of thanks were passed to the Board and to Mr. Cotton and the staff; and the proceedings then terminated.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday Sir FREDERICK MAPPIN, Bart., M.P., in the chair.

The LAW CLERK (Mr. H. Wake) having read the notice convening the meeting, it was agreed to take as read the Directors' report and the accounts for the past half year, an epitome of which was published in the JOURNAL for the 18th ult. (p. 503).

The CHAIRMAN, in moving the adoption of the report, said the past half year had been a very satisfactory one for the Company. The net income, including the interest on the reserve fund of £1443, and £400 that had been received on what was previously considered a bad debt, came to £41,126. Deducting the dividend they were about to pay, amounting to £33,250, there was left a balance to be carried to the present half-year's account of £7875. This sum, added to the balance of the previous half year, would make the amount to the credit of the current half year £12,039. This, he thought, placed them in a very gratifying position. The reserve fund was full, and amounted to £78,613. The increased income during the last six months had been obtained from some of the following items:—There had been an increase in the receipts for gas, of £4617; and on coke, tar, and sulphate of ammonia, to the amount of £7038—or a total of £12,956. They had on the opposite side, the following increased expenditure for the six months:—Coal, £6083; purification, £604; salaries, £75; and stokers' wages, £1828. The advance the Company paid for wages only affected the last seven weeks of the half year. There was also an increase in the amount spent on repairs to works, of £6652; in rates and taxes, £300; and in extra dividend, £807. A sum of £894 less than in the corresponding half year upon one item, left a net increased expenditure of £15,558. Deducting the additional income of £12,956, it was found that the increase of expenditure was £2602 in advance of the increase in income. The policy of the Board, he thought, had been proved to be right in the past. It was the policy of keeping the works, so far as their officers could advise them, in an efficient state, and of discarding old-fashioned and disused machinery. The result of this policy was that they were able to produce an increased amount of gas per ton of coal carbonized. Expenditure in the direction he had indicated, had enabled them to keep the leakage at a very small percentage—4·83. On the make of gas which the Company dealt with, this was an important item. On the occasion of the last meeting of the shareholders, he indicated that the Board considered it probable they would be in a position on Jan. 1 to make a reduction in the price of gas. This was not an actual promise. The Board undertook to consider the matter, and hoped to be able to effect such a reduction. But they did not expect at that time that the prices of all kinds of material—coal in particular—as well as the cost of labour, would go up to the extent they had done. Fortunately, the Company had a large stock of coal on hand, bought at a low price; and he was glad to say that their contracts had not yet expired. He would not make any prediction as to what the future might be; but if he were to advise the coalowners, he should say they would do well to rest satisfied with paying the advance they had just conceded to their men without raising the price of coal. It was not alone in coal and other material that the Company had had to meet extra expenditure; but the wages of the workmen and the hours of labour had imposed upon them serious difficulties. The Directors had felt it their duty to put down machinery which would enable them in the future to lessen the amount of wages payable to those who produced the gas. They had also constructed costly furnaces; and these things had compelled them to dip largely into the revenue of the Company. The demand made by the stokers and other men for higher wages and shorter hours had a good deal of consideration from the Board; and on all occasions, they had felt that a liberal policy in this respect was the right one. The Directors, however, had decided to maintain the present low price, considering the quality of gas which was supplied, of 1s. 10d. to large consumers, and 2s. 2d. to the smaller ones. The shareholders, the Chairman proceeded, were aware that the Directors had made an application to the Board of Trade for power to store gas upon some land belonging to the Company at Neepsend. Opposition was raised by certain residents in the neighbourhood; and the Directors would have been glad if they could have conceded the demands which they made. But they felt they could not do this, if they were to act fairly to others who were in a like position. Happily the opponents of the Order ultimately saw as they did, and withdrew their opposition; and he expected the Order from the Board of Trade would be granted without further delay. He did not know that it was necessary for him to say anything in regard to the electric light. As he had stated before, he believed there was room for both electricity and coal gas; and that so long as the latter was used for the many purposes for which it was now employed, and the demand went on increasing year by year as it was, the Company would be able to pay the same dividend in the future as in the past.

Mr. H. HUTCHINSON seconded the motion, which was carried.

The usual dividend for the half year, at the rate of 10 per cent. per annum, was next declared.

The thanks of the shareholders having been accorded to the Chairman and Directors, the proceedings terminated.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly General Assembly of the proprietors in this Company was held last Tuesday, at the Offices, St. Helen's Place, E.C.—Mr. A. W. GADESDEN in the chair.

The SECRETARY (Mr. I. A. Crookenden) read the notice convening the meeting; and the report of the Directors was taken as read. In the course thereof they stated that the revenue for the six months ending Dec. 25, 1889, was £138,958, as compared with £136,063 in the corresponding period of the previous year; showing an increase of £2895. The expenditure for maintenance was £42,846; for management, £8661—total, £51,507—as against £39,528 for maintenance, and £9521 for management (making together £49,049) in the second half of 1888; showing an increase of £2458. The expenditure on capital account (£24,533) was within a few hundred pounds of that for the previous half year, and was incurred in carrying out the extensions at the Lea Bridge station, owing to the intended closing of the Old Ford works, and the construction of the wells at Lea Bridge and Walthamstow. The quantity of water pumped in the past half year was 7,659,798,930 gallons; being 307,875,206 gallons more than in the corresponding period of 1888. New services to the number of 1960 were laid, as against 2267 in the latter half of 1888. A dividend at the rate of 7½ per cent. per annum was recommended, which would leave an unappropriated balance of £20,863.

The CHAIRMAN observed that, fortunately for the Company, they had been free in the past year from any extra outlay for works or machinery—except, perhaps, in the repair of one of their filter-beds—and their cost for maintenance therefore had been remarkably low. In the comparative statement given in the Directors' report, it would appear that, while the revenue of the half year compared with that for the corresponding period of the previous year had been £2895 more, the cost of maintenance and management had increased in like proportion. Happily, however, that was not so. The year 1888 was misleading, in consequence of a large credit from the Metropolitan Board of Works for the fixing of hydrants. If a comparison was to be made, it would be fairer to take 1886, which was a good average year as regarded expenses. They could not take 1887, as that was a year of drought, and large expenses were necessarily incurred. Comparing their expenses of 1889 with those of 1886, it would be seen that in the past year they had been only £500 more than they were in 1886, though the year 1889 was burdened with an additional pumping-station at Waltham Abbey; the parochial rates had been £700 more; and there had been an increased cost of fuel. He mentioned these things in order to show that their cost of maintenance and management in the past year was very satisfactory indeed. In the year 1889, they had been able to maintain the increased dividend which they commenced some little time ago; and they had also been enabled to increase their undivided profit by a very satisfactory amount, so that the sum they had now standing to the credit of that account was £20,863. The Directors regarded this with very much satisfaction, because, looking at possible contingencies, it was only prudent for a Company like theirs to have some reserve of profit in hand. It must be borne in mind that they had not yet achieved a perfect success in their search for water in the valley of the Lea; and they might have to spend more money than they contemplated on this project. Then, they had adverse legislation to contend against; each year bringing with it a crop of schemes which they were obliged to contest; and the time was very rapidly approaching when the Chamberlain of the City of London would be empowered to put his hand into the Company's till, and appropriate some of their hard-earned profits. All these points suggested the prudence of their having some reserve; and although at first sight £20,000 appeared to be a large sum, yet in reality it was not so, for it was only about 8 weeks' profits. However, notwithstanding all these possible contingencies, the prospects of the Company were by no means discouraging. Perhaps he might venture to put the matter more positively, and say that their prospects were very encouraging. Those of the proprietors who took an interest in the Company—and he hoped they all did—would have noticed, from the monthly reports of the Examiners, the high quality of the water which the Company had supplied to the consumers in the past half year. They would perhaps expect him to say a few words as to the progress of the large works they had in hand. With reference to the works for changing their chief pumping-station from Old Ford to Lea Bridge, the large main, the necessity for which he explained on a former occasion, was completed. That was a work which involved some engineering difficulties, for the water had to be carried twice over the River Lea and once under it. In the cases where it went over the river, the water was conducted in a steel tube, which was self-supporting in the form of an arch; the other portion of the work being, of course, in cast-iron pipes as usual. They had been very fortunate in securing a contract for this main at an unprecedentedly low price; the pipes being delivered on the spot where they had to be placed. When the large main was completed, the two ends were stopped, it was filled with water—the air being carefully drawn out—and a pressure of 130 feet was put on it; and it proved to be absolutely tight. The buildings for the engines and boilers were also in a very forward state; and the work had been carried out by the contractors (Messrs. Kirk and Randall) entirely to the satisfaction of the Company's Engineer. One of the three engines was ready for delivery, and the other two would be ready before the Company could receive them. The boilers were also in a very forward state. He might mention that the Engineer was pretty confident that by the end of July the three engines would be completely fixed and at work, and that he would be ready about that time to deliver the property at Old Ford to the Midland Company. With regard to the progress of the works in the Lea Valley, in their search for water at Waltham Abbey, the works continued as satisfactory as on the last occasion he had the pleasure of addressing the proprietors. The engines worked even more economically than they had hoped; and the supply of water was most abundant. The well at Lea Bridge had no doubt caused them some disappointment; but at present it gave them about a million gallons in the 24 hours. The prosecution of the well at Walthamstow had been a very slow business; but they were assured that it was a very good job, and if slow, was sure. In a few weeks they hoped that the water would be pumped out, when they would be able to continue sinking into the chalk; and there was no doubt they would find there, as everyone expected, a sufficient supply of water. The Engineer had still no doubt whatever that the full amount of 10 million gallons in the 24 hours would be provided from these three wells. They had already got six out of the ten millions; and they had a well and a half to finish. With regard to the schemes that were brought before Parliament affecting the interests of the Company, some of them had died a natural death; but there were three survivals, which were at present being considered in Committee. The most important, as far as their Company was concerned, was the scheme for a railway from Tottenham to Forest Gate. This line would cross the Company's reservoirs, cutting them in two, and preventing—excepting by passing over the property of the Railway Company, as it would then be—their access from one set of reservoirs to the other. That, however, was not the most important part. The water was kept in these reservoirs by puddle banks; and they feared that the constant passing of heavy trains over their filter beds, might so damage the puddle banks that they would lose their water. It was a very serious matter for the Company. They were opposing the undertaking by every means; and hoped that they might be able to throw out the Bill. The County Council had brought in a Bill having reference, among other matters, to subways; and they sought for power to compel the Companies to use, and pay for using, any subways they might provide, under the direction of the County Council. The Bill was going on, though not much progress had been made with it yet; but it was one the Company felt bound to oppose. The other Bill was that of the Central London Railway Company. This was a measure that was not of very much importance to them; but the line crossed their main artery supplying water from the Thames to their district in the East-end; and it was most important that they should get clauses inserted in the Bill for the protection of their interests. He concluded by moving the adoption of the report and the declaration of a dividend for the half year of £3 15s. per cent., less income-tax, on the ordinary stock of the Company.

Mr. HERBERT DALTON seconded the motion.

Mr. H. ROKEBY PRICE argued that out of the undivided balance—which he maintained belonged to the present proprietors—an extra ½ or ¼ per cent. dividend should be paid.

Mr. F. TENDRON, however, considered it would be very unwise for the Directors to increase the dividend unless they could in the future maintain the higher rate. He had no doubt that the Directors had considered this point; and he therefore supported their policy.

The CHAIRMAN briefly replied; arguing against the proposal to increase the dividend.

The motion was then put and adopted; and the retiring Directors and Auditors were re-elected.

Votes of thanks to the Secretary, Engineer, and staff, and to the Chairman and Board of Directors, were passed; and the meeting then separated.

Fareham Gas Company.—At the recent half-yearly meeting of this Company, it was reported that the receipts for the half year to Dec. 31 last amounted to £1531, and that the total expenditure was £1163. The sum brought forward from the preceding half year was £955, which, with the balance of revenue account, made £1323. The amount to be carried forward, subject to the past half-year's dividend of 3 per cent., was £1038. The report was adopted; and a recommendation of the Directors that the price of gas should be reduced from 4s. 2d. to 3s. 9d. per 1000 cubic feet from the 1st inst. was approved. The Company have lately held a successful exhibition of gas appliances, at which Miss A. M. Garstin, of the South Kensington School of Cookery, gave lectures twice daily.

Disputed Gas Consumption.—At the Highgate Petty Sessions, on Monday last week, an adjourned summons, taken out by the Hornsey Gas Company against a Mr. Morris for 4000 cubic feet of gas supplied to his house in Westfield Road, Hornsey, was heard. The defendant disputed the charges made upon him, on the ground that he had not consumed the gas; the meter having, he alleged, registered incorrectly in consequence of being out of level. A fitter, in the service of the Company, said it was not necessary for a dry meter to be fixed perfectly level; but it was in the case of a wet one. He was of opinion that Mr. Morris should have put the meter right himself. Defendant said he had thousands of gas lights under his charge; and whether the meter was a dry or a wet one being slightly out of the perpendicular would make a difference in its registration. It would, in fact, register 65 instead of 30 cubic feet of gas. One of the Company's collectors stated that the meter had been tested and found correct. The defendant was ordered to pay the claim, and costs.

The Rating of the Ardsley Reservoir of the Wakefield Corporation.—At the Wakefield West Riding Court recently, the Corporation of Wakefield were the defendants in an action in which the Overseers of East Ardsley claimed payment of £125; being a rate payable in respect of the Corporation reservoir at Ardsley. The defence was that the question of the assessment of the Corporation works at East Ardsley was now before the Assessment Committee; and that, pending the hearing of the appeal, the Corporation had offered to pay half the claim on account, but this was refused by the Overseers. Ultimately the Bench made an order for payment of the claim, with costs. A similar claim was made by the Overseers of West Ardsley for payment of a rate (laid in June) of £150 in respect of the portion of the Corporation works lying within that township. The contention for the defence was that, according to the rate-book, the Corporation had not been duly rated. It was pointed out, however, that the rate had been accepted by the Corporation, and then appealed against. The Bench made the order, with costs.

THE SALFORD GAS SCANDAL.

The Ratepayers' Committee and the Proposed Investigation.

As briefly stated in the JOURNAL last week, a meeting of the General Committee for promoting a petition for a parliamentary inquiry into the Salford gas frauds was held on the 28th ult., in the board-room of the Manchester Chamber of Commerce, for the purpose of electing a Chairman and Vice-Chairman and appointing a deputation to present the petition. Mr. J. Bancroft presided. Two gentlemen (Mr. G. C. Haworth and Mr. C. M. Wilson) having been elected to the offices named, Mr. Mandley made a long speech dealing with the Hunter commissions, and Mr. Lever's action in bringing them to light. Referring to what had been done by the Salford Corporation, he said proceedings had been instituted against about ten people for the recovery of money; and if they might take it as true, in every case except that of Mr. Ellis Lever, that money had been paid, thereby by implication proving that the charges of bribery brought against the contractors were well founded, it would be highly desirable for these men to be interrogated. They had it in evidence that one man had robbed them according to his (Mr. Mandley's) estimate, of between £30,000 and £40,000; and he had been let off for £1000 or less. It would be very desirable to have this man put into the box, and his books and papers impounded to show the extent of his robberies. Mr. Jackson expressed the opinion that the petition of the Salford Corporation in favour of a Commission would lessen the work of the Committee; and he asked for the terms of the Corporation's petition. Mr. Mandley said the Corporation's petition had not been drafted. He hoped he was not doing his colleagues in the Corporation any injustice, but he was afraid no vigour would be shown in connection with the petition. At all events, he should leave the Corporation to act independently in the matter, and proceed with the petition of the ratepayers. Mr. Rycroft pointed out that the immediate business before them was the nomination of a deputation and the settlement of the method of procedure. He thought four or five gentlemen should proceed to London and obtain the support of as many members of Parliament as they could in connection with the presentation of the petition to the House. After some further discussion, the deputation was appointed. Mr. Mandley subsequently stated that the signatories to the ratepayers' petition, calculated up to that day, numbered rather more than 15,000. He then referred to the agreement entered into by the Salford Corporation with Hunter, and submitted the following memorial which he had drawn up for presentation to the Council:—"We, the undersigned ratepayers of the county borough of Salford, are strongly of opinion that, in the interests of the ratepayers generally, and in order to secure purity in the future administration of the affairs of the borough, legal proceedings should be taken or continued against every person or firm alleged to be implicated in the frauds in connection with the Corporation Gas-Works. Also that any release of your claim or claims against any person or persons alleged to be so implicated, unaccompanied by a proper judicial or independent official investigation of such frauds, would be highly detrimental to the true interests of the Corporation, and contrary to public morality. We therefore pray your worshipful Corporation to take prompt steps to get annulled the agreement made by your Consultative Committee with the convict Samuel Hunter, and to continue the proceedings against Samuel Hunter, John Graves Hawkins, and the incriminated contractors, and to withhold every release of your claims until such official investigation has been made and full restitution obtained." It was decided to present the memorial (which was done on the following Monday); and the proceedings closed.

The Disposal of Mr. Lever's Donation to Brunswick Chapel.

The interesting incident, in the recent proceeedings against Mr. Ellis Lever, of the contribution by him of £50 to the building fund of Brunswick Chapel, Pendleton, has given rise to some correspondence in the local papers, and was before the Salford Town Council at their meeting last Wednesday. As will be remembered, it was stated at the trial that this money was given in settlement of a dispute which Lever had had with Hunter. This Mrs. Lever, on behalf of her husband, has denied. She states that he had been asked by Mrs. Hunter and Mrs. Keevney to contribute £100 to the fund, but said he would only give £50; and this sum he took to the chapel and placed in the collection-box himself—the money being received by Mr. Alderman Keevney. On the following day he received a letter thanking him for his "generous contribution," which Mrs. Lever states was quite a voluntary gift, and had nothing to do with any dispute or settlement with Hunter. In a letter addressed by Mr. Lever to Mr. Alderman Keevney on Dec. 1, 1888, which the latter has had published with other letters bearing upon the matter, he indignantly denied that his donation to the chapel funds was anything else than a voluntary offering on his part. He said: "That any man should insinuate that I gave £50 to your chapel at Pendleton to appease Mr. Hunter, or to obtain business with the Corporation, is a slander upon your church, your Corporation, and myself. I have given thousands of pounds in my time to religious and charitable institutions; but I have never yet given in the hope of getting." To this Mr. Keevney replied: "Before you came to the Pendleton chapel in 1881, you preferred certain charges against Mr. Hunter, which were subsequently withdrawn by you at the Gas Committee. This circumstance greatly exalted Hunter, and you were spoken against everywhere by him; and, rightly or wrongly, he advanced the statement that this £50 was a payment to avoid legal proceedings. This was named to myself and others again and again long before the chapel opening, and repeated in the corridor the same evening you gave the money. Fact and statement agreeing so exactly, I fear it will be difficult to establish your theory." He went on to say that he disliked Mr. Lever going to Pendleton, and appearing intimate with Hunter, when the outer world thought them enemies. In response to this, Mr. Lever asserted that, notwithstanding what Hunter might have said, he never offered to pay the £50 to any public institution; and that the giving of the money to the chapel had nothing to do with the settlement of the dispute between them. He added: "If you disliked my coming to Pendleton at the time named and dislike it now [Dec., 1888], why not have returned the cheque for £50 which I placed in the box, instead of sending, as one of the Trustees, a letter through Mr. Alderman Davies thanking me for my 'generous contribution?'" After this Mr. Keevney notified to Mr. Lever his intention of making a statement in the Council unless some apology were offered to him; and this was subsequently tendered and accepted. At the Council meeting, the Mayor (Mr. B. Robinson), referring to the receipt of the cheque for £50 from the Trustees of the chapel, said there appeared to be some hesitancy about keeping it; and he asked the Council to say to what charitable object they would be pleased to devote it. A proposal was then submitted to give it to the Salford Royal Hospital; and another suggestion was that it should be returned to the Trustees. This called up Mr. Keevney, who wanted to offer an explanation on behalf of the chapel authorities, but was not allowed to do so. A third proposition (brought forward by Mr. Rycroft) was that the money should be put into the gas fund, as it was really the property of the Corporation. The Town Clerk thought that it could not be so regarded, inasmuch as it had not come out of their pockets. Eventually, the first proposal was adopted.

Meeting of the Salford Town Council—A Scene.

At the Meeting of the Salford Town Council last Wednesday—the MAYOR (Mr. B. Robinson) in the chair—the business consisted mainly of matters immediately connected with the gas-works scandals.

The Town Clerk (Mr. S. Brown) read the following report of the Consultative Committee:—

> Your Committee report that the action brought by the Corporation against Ellis Lever for the recovery of the sum of £2329 corruptly obtained by him under secret agreements with the late Gas Engineer, Samuel Hunter, for the payment of a commission on the coal and cannel supplied to the gas-works, was tried before Mr. Justice Day and a special jury, at the Leeds Assizes, on the 25th of March, and judgment given for the Corporation for that sum and costs. The amount of the judgment debt has since been paid into Court. Your Committee have discontinued the proceedings against the executors of William Healey, deceased, as they were unable to obtain such reliable evidence as would justify a continuance of the proceedings; and further, they were advised that the claim of the Corporation being founded *in tort*, the right of action died with the person.

The MAYOR having formally moved the reception of the report,

Mr. RUDMAN said he would be glad if the Town Clerk would state whether the sum obtained from Mr. Lever was in addition to the £10,000 which Hunter had agreed to pay. The ratepayers were under the impression that it was part of the £10,000 in the bank.

The TOWN CLERK replied that it was in addition; and said there was a further sum of between £400 and £500 to put to it.

Some discussion then took place as to whether the terms of the contract with Hunter could be discussed under cover of the resolution asking the Council to adopt the Consultative Committee's report.

The MAYOR remarked that the question of the contract was a separate one altogether.

The TOWN CLERK urged that inasmuch as they had been told, in connection with the payment of the money into Court, that possibly there might be an appeal, he thought it would be a little unwise to attempt then to discuss the terms of the agreement.

Mr. RYCROFT said he must take exception to the report, as it did not contain a true statement of the facts. The action against William Healey's executors had not been "discontinued," but had really been dismissed with costs against the Corporation, and had been dismissed because the Town Clerk had not filed an affidavit as to documents for which the defendants had asked. The Town Clerk's failure to do this had resulted in the dismissal of the action; and the Corporation were precluded from taking further action against Healey's executors. The statement of claim in the action claimed from Healey's executors a commission of 5 per cent., which Healey was said to have paid to Hunter on goods supplied to the gas-works in the years 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, and 1885. He contended that such an action on a question of contract was not *in tort*, as the Town Clerk had said.

The TOWN CLERK said he entirely dissented from Mr. Rycroft's law. The action was eminently an action *in tort*, and consequently died with the person. In that opinion he was supported by the most eminent Counsel in England. In his judgment it would have been an unwise thing to file the affidavit in question. Knowing the action was one that they could not by any possibility have brought to a successful issue, he thought it wise to allow it to be dismissed. The effect of the dismissal was not a bar to any future action, as Mr. Rycroft had said.

Mr. SHARROCKS inquired the reason of the evidence being considered unreliable. Was it this—that the Council were the servants of Mr. Hunter, and that where he liked to give reliable evidence he would do so, and where he did not like, he would not.

Mr. MANDLEY said nothing had surprised him more than to find that the Town Clerk and members of the old Gas Committees could not find evidence of bribery on the part of the late Mr. William Healey. It would be within the recollection of the Council that at least ten years ago he (Mr. Mandley) charged Mr. Healey with bribery; and it had been shown since then that he was among the most flagrant bribers of Hunter and other officials of the Corporation. Evidence would have been found if it had been looked for. Evidence had been found, and had been notorious about the borough—not since Hunter's conviction, but years before.

The TOWN CLERK said his version of the law was as recorded at the end of the report. If that was correct, the present was almost the worst time to discuss the question whether or not Healey bribed.

After some further discussion, the report was adopted by 36 votes to 13.

The TOWN CLERK then read the petition presented on behalf of the ratepayers, as given above.

Mr. MANDLEY explained that the Committee who had organized the meeting at which the petition was determined upon numbered 63 gentlemen, of whom about a dozen were Magistrates.

The TOWN CLERK next read the following petition, which, in accordance with instructions received at the previous meeting, he had prepared for presentation to Parliament by the Corporation:—

To the Honourable the Commons of the United Kingdom in Parliament assembled.

The humble petition of the Mayor, Aldermen, and Burgesses of the county borough of Salford, acting by their Council, showeth as follows:—

1. That your petitioners are the owners of the gas-works and undertaking in and providing for the supply of gas to the county borough of Salford and a large area of the adjoining district.

2. That it is generally believed and admitted on all hands that corruption and bribery have existed in the management of many gas-works undertakings in Lancashire and Yorkshire, in the form of bribes or commissions paid fraudulently to managers for the purpose of securing orders for coal, cannel, meters, and other materials and articles for use by such undertakings.

3. That in February, 1887, your petitioners discovered that their Gas Engineer and Manager, one Samuel Hunter, who entered their service in 1875, but who for some years previously had held a similar position in a neighbouring Lancashire borough (where it is believed the practice of paying bribes had existed), was continuing to receive bribes or commissions in his office, and he was thereupon discharged from the service of the Corporation, and an action in the Chancery division of the High Court of Justice was commenced against him and one John Greaves Hawkins (a Gas-Works Manager at Wigan) for payment of the sum of £2250 paid to them on one contract, and for an account of other similar sums, and for payment thereof.

4. That in the course of the said proceedings the said Samuel Hunter was found to have been guilty of forging a letter purporting to be an authority from the Chairman of your petitioners' Gas Committee to the said Samuel Hunter to receive commission on a certain contract. He was indicted for that offence and for perjury, and also for obtaining money under false pretences. To such indictments he pleaded guilty on the 19th of March, 1888, and was afterwards sentenced to various concurrent terms of imprisonment, the longest of which was five years' penal servitude.

5. That your petitioners have been unable to ascertain the exact extent to which they have been defrauded, and have therefore been unable, as they believe, to recover the whole sums of money of which they have been so defrauded.

6. Your petitioners have, they believe, thoroughly and fully investigated the matters; and although they do not know exactly the full length to which the bribery has extended, they are satisfied they have ascertained the names of the contractors connected with such bribery. But as the public mind of the county borough of Salford and surrounding district has been greatly moved by the matters connected with the legal proceedings arising out of such frauds, your petitioners are anxious to take such other steps as may tend to purify the commercial atmosphere, and to prevent dishonest practices being exercised elsewhere.

7. Owing to the secret nature of these frauds, your petitioners believe that it is impossible, unless by means of a Parliamentary Commission, armed with full powers of calling before them persons and documents, and also of granting free pardons and indemnities, further to investigate the said frauds.

Your petitioners therefore pray that your Honourable House will be pleased to appoint a Commission to fully inquire into the fraudulent practices complained of.

Alderman MAKINSON suggested, as an amendment to any resolution accepting the terms of that petition, that he should be permitted to move the following resolution:—"That, in the opinion of this Council, it is desirable, in the interests of commercial morality generally, that any inquiry on the subject of the gas frauds should be in the nature of a roving commission empowered to take evidence in other places besides Salford."

Mr. PHILLIPS thought Mr. Makinson's resolution could come on later as a substantive motion.

Alderman M'KERROW seconded Mr. Makinson's amendment.

Mr. PHILLIPS then said that, in order to put the matter in shape for discussion, he would move that the common seal of the Council be affixed to the petition just read. He proposed, however, that the words "Lancashire and Yorkshire," in the second clause, should be left out; and that instead of actually saying they had "fully and thoroughly investigated" the matter, they should say they had "endeavoured" to do so. He wished to leave out all mention of the locality, because he held that it was altogether wrong for them, as a Municipality, to be throwing stones at other municipal bodies.

Alderman BAILEY seconded the motion.

Alderman WALMSLEY, in supporting it, said he hoped that the Council would not endeavour, by casting mud at other people, to shield itself from any righteous punishment that it might deserve. If they had made any mistakes, let them be bold enough to confess them, and let them also be bold enough to redress them. They would gain nothing as a Council, nor would commercial morality gain anything, by the Corporation of Salford attempting now to shift on to other people the responsibility which attached to themselves.

Mr. MANDLEY said he was quite convinced that the fraudulent practices complained of were carried on notoriously not only in Lancashire and Yorkshire, but throughout Great Britain. The resolution, in his opinion, and in that of many others, was an artful device to prevent the granting of the prayer of the petition by Parliament, by asking them to enter into an undertaking of such magnitude that they would not listen to it.

Mr. RYCROFT said he understood that at this stage of the proceedings they were to have an opportunity of discussing the whole question of the gas frauds. This being so, he called upon the Town Clerk to produce the agreement with Hunter. The Town Clerk had that agreement before him on his desk, and he (Mr. Rycroft) called for its production.

The MAYOR said they were not then discussing the agreement; they had the petition before them.

Mr. RYCROFT: Then I want to know at what stage of the proceedings I shall have an opportunity of alluding to that compact.

After a little "scene" between the Mayor and Mr. Rycroft on the question of the production and discussion of the agreement, the opinion of the Council was taken; and it was decided, by 30 votes to 17, not to discuss the matter then—the Mayor intimating that an opportunity would be afforded for doing so at the next meeting, by which time the outcome of Mr. Lever's appeal, if made, would be known. This was, he said, the only reason for postponing the discussion. When the result of the voting had been announced, an extraordinary scene followed. Mr. Mandley, apparently labouring under great excitement, rose and stated that an Alderman and a Magistrate of the borough had said he would like to "smash" his (Mr. Mandley's) face. This statement was received with a burst of laughter; and great disorder ensued. The Mayor endeavoured to bring the members back to the business before them; but Mr. Mandley persisted with his complaint—assuming a threatening attitude towards Mr. Alderman Robinson, who, it turned out, had made use of the expression complained of. This gentleman only reiterated his wish; adding that, after what had been witnessed at that and other meetings of the Council, it was a luxury which a great many other members would like to indulge in. The disorder which followed this remarkable speech from the aldermanic bench was so great that it was in vain that Mr. Mandley tried to make himself heard. All that was audible was the word "Shame." The Mayor again protested; reminding the members that they were a party of "gentlemen," and ought to conduct themselves as such. He expressed his sorrow at the occurrence of such a scene, which was most derogatory to the dignity of the Council. In the midst of the excitement, Mr. Roper moved the adjournment of the Council. As there seemed no prospect of order being restored, the Mayor put the motion, and it was adopted; bringing to a close a scene which is stated to have been unparalleled even in the annals of the Salford Town Council.

MANCHESTER CORPORATION GAS SUPPLY.

The Alleged Bribery of a Former Superintendent—The Lighting of Courts.

At the Meeting of the Manchester City Council last Wednesday—the MAYOR (Mr. Alderman Mark) in the chair—the minutes of the Gas Committee contained a recommendation to the effect that a Special Sub-Committee should be appointed to investigate the allegation made in the course of the trial of the action brought by the Salford Corporation against Mr. Ellis Lever, that the late Mr. Peacock, who was Indoor Superintendent of the Gas Department, had been guilty of receiving bribes from Mr. Lever; and also that "all persons who have been or may hereafter be found to be guilty of bribing the servants in the employment of the Corporation of Salford shall be struck off the list of persons tendering for material and labour for the Corporation of Manchester."

Alderman KING, who, in the absence of the Chairman and Deputy-Chairman of the Committee, moved the adoption of the recommendations, remarked with regard to the first, that although the allegation against the late Mr. Peacock had been made by a man who was under conviction for perjury, it was a charge against the Corporation of Manchester which the Gas Committee felt they ought to meet; and therefore they had appointed a Committee to investigate the matter.

Mr. CHESTERS-THOMPSON expressed his approval of the course taken by Mr. Alderman King.

Alderman ASQUITH said he should have to move an amendment, to the effect that the resolution relating to the striking out of the list of all firms proved to have bribed in Salford, be not approved. He thought that such a resolution would inflict injustice on certain firms he could name, because the men at present composing those firms were free from all complicity in acts which their predecessors might have done. He would, therefore, move that the proceedings of the Committee be passed with the exception of the resolution referred to.

The MAYOR suggested whether it would not be well to bring up the resolution after the investigation of the Committee.

Alderman KING was understood to express his willingness to this being done.

Mr. ANDREWS: Would there be any objection to giving the members of the Council a statement of the names of the various contractors in the Gas Department, the length of their contracts, and how long they have yet to run, and particularly the addresses of some of the contractors?

The MAYOR said he thought it would be scarcely fair to do this.

No one seconded the amendment, and consequently it fell to the ground.

Mr. CLAY protested against Mr. Alderman King, on behalf of the Gas Committee, being allowed to withdraw a portion of the resolution from the minutes. When it was proposed in Committee to strike off the list of contractors all persons who had bribed in Salford, he strongly opposed it. He (Mr. Clay) objected to any part of the resolution being withdrawn from the minutes now to be approved; and asked that the proceedings of the Committee should be passed in their entirety.

Mr. SOUTHERN put in a plea for a little information as to how the Committee intended to proceed in the investigation. He would, he added, be delighted if the investigation should take the widest range; and he said he entirely endorsed the emphatic words of the resolution, that all persons found guilty of bribing officials should be struck off the list of contractors.

Alderman KING, in reply, said the Committee were prepared to go into any question that might be raised as to their manner in which they had done their business.

The minutes were approved.

Mr. SCHOU, referring to a resolution by the Gas Committee to the effect that they could not at present recommend the Council to authorize the lighting of private courts and passages at the public expense, urged that there were many dismal places in the districts inhabited by the working classes which might be better lit. By a little modification of the lighting of the central thoroughfares in the night, the better lighting of these courts and passages might be carried out by an expenditure of not more than £200 or £300 per annum beyond the capital outlay, which might be about £600. He instanced the action of the authorities in the great towns of Scotland in this matter, and urged that on grounds of decency and health the Council should adopt such a policy. If the cost were a great deal more than he estimated it at, he contended that the money would be well spent. He

suggested, as a compromise, that a number of the worst courts should be lighted by the Gas Committee—such courts to be selected on the joint report of the Chief Constable and the Medical Officer of Health. He put this in the form of a motion.

Mr. HUTT seconded the proposition.

Alderman THOMPSON said the Council had to consider the ratepayers generally; and he regarded the proposal of Mr. Schou as another sign of a prevalent tendency to allow the idle and dissolute to live on the thrifty. The Corporation lighted well the chief thoroughfares; but it was not the function of the Corporation to light up insanitary property.

Dr. SIMPSON endorsed the observations of Mr. Schou, and supported the resolution on the grounds of health, decency, and morality, and the safety to person and property.

Alderman KING said the Gas Committee were prepared to accept the suggestion thrown out by Mr. Schou as part of the original motion.

The proceedings of the Committee were thereupon approved.

STOKE-ON-TRENT CORPORATION GAS SUPPLY.

The Condition of the Works.

A Special Meeting of the Gas Committee of the Stoke-on-Trent Town Council (consisting of the whole of the body) was held last Tuesday, the Deputy-Mayor (Mr. Alderman Leason) presiding—for the purpose of considering reports as to the condition of the gas-works. The Gas Engineer (Mr. H. Taplay), in his report, stated that the plant was in such a dilapidated condition, and so antiquated, that it was impossible to get the high duty obtainable from modern plant. Having given details of the defects in the present works, Mr. Taplay recommended the acquisition of a new site for gas-works by the purchase of the entire land and property between the canal and the railway in Lytton Street. This street would have to be closed; and upon this site could be erected large and commodious works, with a siding from the railway. The cost of this scheme he estimated at £26,000. Of this £23,000 would have to be raised in the way of new capital, involving an annual charge of £1005 for interest and redemption. This report was referred for consideration to a Sub-Committee, who, having gone into the matter, recorded the opinion that the works were not in a dilapidated condition, although considerably worn; but that if they were remodelled, and all modern retorts and improvements added, the producing power would not be equal to the demand in seven years' time. As to gasholder accommodation, they stated that they had 30 per cent. less capacity than when Fenton was supplied; and the present requirements of Stoke being near what was then stored, additional convenience was necessary in the shape of a new holder—the estimated cost being £10,000, with a possible addition of £2000 for land. The whole cost of the required plant and works was £26,000; and the Committee asked if it would be wise to sanction such an expenditure, and leave the new venture practically untouched. With regard to the present position of electric lighting, the Sub-Committee felt that they need not fear its competition; but if the new works were erected there would be convenience for supplying both gas and electricity. The Deputy-Mayor said that the reports might appear to a layman to be overdrawn—and, having been made known to the public, had been much misunderstood, and given rise to unnecessary alarm—but this was really not the case. The works had not been neglected by the Gas Committee; but the bulk of the plant which was taken over by the Corporation when they acquired the works had served more than the average life of such apparatus. It had, however, been kept in as good repair as possible by the Gas Committee. The main question for their consideration was whether a new gasholder was needed; and if they came to the conclusion that it was, it would then be necessary to consider whether it would not be the wisest course to construct new works. He contended that they did require a new holder, inasmuch as at the present moment their storeage capacity was not sufficient to meet one day's consumption. Mr. Taplay observed that this storeage power was 350,000 cubic feet; while a day's consumption was 500,000 cubic feet. Mr. Jones moved a formal resolution declaring that a new gasholder was necessary; and this was seconded by Mr. Holtom. After some discussion, Mr. Wynne moved an amendment to the effect that the Committee, having considered the reports on the state of the works, were of opinion that the information contained therein was not sufficient to justify them in recommending any further extension of them at the present time. This having been seconded by Mr. Alderman Kirkham, the Deputy-Mayor said he still thought a suggestion previously made by him was the best under the circumstances—viz., that they should call in some experienced person familiar with the town and its requirements to investigate the matter and advise as to the best course to be adopted. Mr. Jones withdrew his motion; and Mr. Wynne's amendment having become the substantive motion, the Deputy-Mayor moved an amendment to the effect that the opinion of some independent person be obtained. This, however, was lost; and the motion was carried by five votes to four. The Gas Committee, at a subsequent meeting, decided that £1000 should be handed over to the Corporation towards the reduction of the rates, provided the Corporation pay over to them next month £450 for lighting the public lamps.

Sevenoaks Water Supply.—The Local Government Board have approved of the construction of water-works at Chevening by the Sevenoaks Rural Sanitary Authority, and have authorized the raising of a loan of £700 to be expended for the purpose.

City of Dunedin Gas Company.—The case of *Grimston v. City of Dunedin Gas Company*, which came before Mr. Justice Stirling last Tuesday, was an action by a debenture-holder asking for the usual relief claimed in such actions. By an order made on Aug. 2, 1889, one of the Trustees of the debenture deed was appointed receiver; and as it was possible that a reconstruction scheme would be completed, the plaintiff asked for judgment carrying into effect the trusts of the deed, and for an account of what was due in respect of principal and interest. His Lordship made the order.

THE BOLTON CORPORATION COAL CONTRACTS.

At the Meeting of the Bolton Town Council on Wednesday last, the business consisted mainly of a discussion of the report presented by the Gas Committee on the subject of certain alleged irregularities with regard to the coal and lime contracts. Our readers will remember that some months ago Mr. Kirkman, one of the Labour representatives in the Council, declared that the borough was losing upwards of £3000 per annum on the lime and coal contracts, owing to the quality of material supplied being much inferior to that contracted for. Afterwards hints were thrown out that this had been done systematically; and that whilst the evil had been more pronounced during the winter months, it had been going on some time. Mr. Stredder subsequently gave notice that he would move a special resolution on the subject, asking if it was not a fact that inferior coal had been supplied within the knowledge of certain members of the Committee; and, if so, why the contractors had not been made to refund by way of compensation. The Gas Committee meanwhile appointed a Sub-Committee to investigate the matter; and after a long inquiry, the result of their deliberations has been made public. The Sub-Committee, by 6 votes to 1, reported that there was no reasonable ground for the allegation that the Corporation were suffering the loss suggested; and that, though there had been cause for complaint, as must always be the case where large quantities of material are supplied, "the contractors have striven, to the best of their ability, honourably to discharge their obligations in a satisfactory manner." Mr. Holt, a member of the Sub-Committee, with Messrs. Kirkman and Tootill, members of the General Committee, opposed this report, on the ground that it did not represent the true facts of the case.

Alderman MILES, in moving the adoption of the report, entered into a lengthy explanation of the matter. He said he believed the report of the Sub-Committee to be an honest, conscientious, and faithful one. The first point he would deal with was the recommendation to provide themselves with coal very much more largely during the summer months, in anticipation of any difficulties arising during the winter. If they were to provide accommodation for the storeage of 20,000 tons, it would mean an additional cost of 1s. per ton; and besides this the longer the coal remained stacked, it lost in quality. As to the charges which had been made, he asked if the Council or any of the members of the Gas Committee believed that the contractors had ever, during the last winter, or at any other time, attempted to palm off coal which they knew perfectly well was not according to contract. [Mr. STREDDER: Yes.] He gave Mr. Stredder an absolute and unqualified denial; and their Engineer had done the same. He himself had never for a moment believed it. Their requirements were so great during the past winter, that they had to get the fuel to the retort-house for use as soon as possible; and the coal proprietors had been very considerate in allowing them extra supplies in times of push and difficulty, which should not be forgotten. He admitted, however, in answer to Mr. Stredder, that no deductions had been made for inferior coal supplied since November, 1888. The complaints which had been made about the coal were highly coloured; the object presumably being to get strong representations made to the contractors. As a proof of this statement, he quoted statistics showing that a higher percentage yield of gas was secured from their coal supplies last year than in the previous twelve months. Alderman Miles proceeded with further details; but was constantly interrupted by members of the Labour party.

Mr. HOLT moved an amendment to the adoption of the report, with the following rider:—"This Council hereby desires to express its conviction that if such report be adopted it will be detrimental to the interests of the Gas Department, inasmuch as it would be a direct reflection upon the Engineer and others, whose duty is to report upon the quality of goods used by the Corporation, and also be an encouragement to contractors to take advantage of their agreement." He said the report was misleading, and would encourage coal contractors to supply a poor material. He alleged that one of the complaint-books was missing; so that the Sub-Committee could not get at the real character of the complaints. It was not for them to raise excuses for the contractors, but to see that the contractors supplied fuel in accordance with the terms of their contract. In conclusion, he said that, if they desired to strengthen the hands of their officials, they must reject the report; for if they did not, it would perhaps lead to a system of corruptive imposition.

Mr. KIRKMAN seconded the amendment.

A warm and protracted discussion, extending over four hours, ensued, the result of which was that the amendment was lost by 30 votes to 7.

Mr. STREDDER then moved for a return of the names of those contractors who were said to have supplied bad coal and lime, with a view to action for compensation.

Mr. KIRKMAN seconded the motion.

Alderman DOBSON moved the adjournment of the Council.

Mr. STREDDER excitedly protested against this; and on being called to order, shouted out that he would give notice from month to month until it was considered. He declared in wild terms that it was a dodge to prevent discussion and to shield others.

Ultimately the adjournment was agreed to, amidst great excitement, by 16 votes to 13.

Increase in the Price of Gas at Fenton.—At the last meeting of the Fenton Local Board, it was stated that the Gas Committee had been reluctantly compelled, in consequence of the increase in the cost of coal, to advance the price of gas 2d. The additional cost in the manufacture of gas would have been equal to about 6d. per 1000 feet; but the sum realized from the sale of residuals had reduced that extra expense, which, however, still amounted to considerably more than 2d. per 1000 feet.

THE PROPOSED ELECTRIC LIGHTING OF PADDINGTON.

The Vestry of Paddington have lately had two special meetings to consider the subject of electric lighting, without being able to arrive at any definite conclusion thereon. The matter, as our readers are aware, has been investigated by a Special Committee, the result of whose deliberations has been a recommendation that the assent of the Vestry should be given to the application of the Kensington and Knightsbridge Electric Lighting Company, who are competing with other Companies for the supply of the district. This recommendation is, however, qualified to a certain extent. They call the Vestry's attention to the fact that the Board of Trade are preparing regulations by which objections to the high-pressure system will be removed; and, under these circumstances, they suggest that the application of the Metropolitan Electric Supply Company might be considered. Both the Companies object to the insertion of any clause reducing the time for purchase below 42 years. As the cost of lighting the streets by electricity will, as was shown in the JOURNAL a fortnight ago, be greatly in excess of that of gas, the Committee do not feel justified in recommending it, though they think that in the future, when the electric lighting companies' arrangements have been more matured, action may be taken for doing so with advantage. The report came before the Vestry at their meeting on the 21st ult., when Colonel H. C. Barchard, in proposing its adoption, said that, since it had been drawn up, the Metropolitan Company had varied their list of prices; and probably the other Company would desire to do likewise. He therefore proposed that the Company should be communicated with, for the purpose of learning their views. Colonel Blair opposed this, and urged that the recommendation of the Committee should be adopted. Mr. H. H. Mills proposed, as an amendment, that the Company's Provisional Order be amended, inasmuch as the Draft Order prepared by the Committee did not secure to the ratepayers such advantages as they were entitled to receive as a consideration for the very valuable concession involved in the granting of assistance to the Company to obtain an Order for lighting the parish. Mr. T. S. Anderson seconded the amendment. Mr. Mark H. Judge opposed both the propositions before the Vestry; and in doing so characterized the report as an untrustworthy document. This was as far as the Vestry could get at the meeting on the 21st ult.; and therefore the subject came up again on the 25th. Mr. Judge, resuming the discussion, pointed out that, unless the Vestry quickly came to a decision, no Provisional Order relating to Paddington could be procured during the present session; but he believed that in any case the interests of the parish would be safeguarded by the refusal of the Board of Trade to assent to any Order which had not first received the Vestry's approval. Mr. Hanny said that in his district (Bayswater) a strong feeling was manifesting itself against the Vestry at the delay which had occurred in this matter; and the inhabitants were very desirous of having the electric light under reasonable conditions. The Vestry had had the matter under consideration nearly two years; and, as far as he could see, they were now as remote from arriving at a decision as they were at the beginning. Mr. Minchin urged that it was only fair for the Committee to consider the claims of the House-to-House Electric Lighting Company, or, at all events, to hear what the representatives of that Company had to say. Mr. See thought that, in the circumstances, it would be better to refer the whole matter back to the Committee for reconsideration and report. This was eventually done.

THE PROPOSED PURCHASE OF THE WARRINGTON WATER-WORKS BY THE CORPORATION.

The poll of the ratepayers of Warrington on the subject of the Improvement Bill has resulted in a majority of 803 votes being recorded for the measure. For the purchase of the water-works—the real question at issue—2488 votes were recorded; while against it there were 1685 votes. The result was declared last Tuesday. On the same day a meeting of the Corporation was held at which the Bill was under discussion. Mr. Flood inquired if it was the intention of the General Purposes Committee to have a valuation of the stock and plant of the Company, now that they had carried the poll. The Mayor (Mr. Alderman Francomb) pointed out that the Committee had already passed a resolution instructing the Town Clerk to submit to the Company the proposal of the Sub-Committee for the purchase of the undertaking, subject to the approval of the Council and the ratepayers, and to an examination of the Company's property and accounts. Alderman Harrison suggested that some gentlemen entertained too florid an idea of how far an examination into the water-works accounts and the nature of the property would be permitted to go. It should be borne in mind that the Company were not sellers, but that the Corporation were going to them, and would therefore have to depend upon the Company as to how far these investigations might be carried. He was sure, however, that the Company would behave handsomely and straightforwardly, and would give the Council every reasonable facility for seeing what they were about to purchase. Replying to a further question by Mr. Flood, Alderman Harrison explained that it was intended to call in the services of an expert. Mr. Flood said the general feeling outside the Council was that they were running blindly at a bargain. Alderman Harrison said it was understood that they could not do anything until scientific opinion had been obtained as to the nature and quality and probable supply of the water; and the public need be under no anxiety on that ground. Some conversation followed as to the costs already incurred in the promotion of the Bill; and the matter then dropped.

The Gas Exhibition at Belfast.—In the paragraph on this subject which appeared last week, it should have been stated that the appliances shown were simply some of the newest forms of stoves, &c., made by Messrs. T. Fletcher and Co., who at their own cost arranged for the course of lectures delivered by Miss Young.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

Bailie Archibald, of Leith, has "engineered" his little squabble with the Town Council magnificently. Being an old hand, I might have expected as much. There can be no doubt he knew the people he was dealing with; and that when he gave up his seat at the Gas Commission, he was playing his strongest card, because at the Commission he is almost indispensable. The result was that at Tuesday's meeting of the Town Council, after a little wriggling on the part of his colleagues at the prospect of eating the leek, they had to yield; and by ten votes to two they adopted a resolution which "regretted that some irregularity had led to a misunderstanding between Bailie Archibald and the Council, and requested him to depart from his resignation." Bailie Archibald accepted this as a sufficient humiliation, withdrew his resignation, and was at once unanimously re-elected to the Gas Commission. His services will therefore not be lost to the community in a sphere in which he is admittedly one of the strongest forces.

It is not surprising that attention should be directed to the quantity of gas consumed by officials of the Dundee Gas Commission who are supplied with gas as a part of their emoluments. Ex-Provost Brownlee raised the question at a meeting of the Works Committee of the Dundee Gas Commission on Monday. He said that gas was consumed in the late Treasurer's house to the extent of £46 per annum, in the Gas Manager's house to about £33 per annum, and in the attendant's and inspector's houses from £6 to £7 per annum. This, he thought, was a gross abuse of the privilege conceded to them, and he asked the Clerk to produce the minutes containing the conditions under which these officials were to be supplied with gas. The minutes specified that free gas was to be given; and the Clerk explained that this could only be held as meaning gas for illuminating purposes. A long discussion took place; after which it was moved by the Convener, and seconded by ex-Bailie Gentle, that free gas for both illuminating and heating purposes should be given. Ex-Provost Brownlee moved, and Mr. Ritchie seconded, that officials be allowed gas for illuminating purposes only. The motion was adopted. The subject was brought up by Mr. Brownlee at a meeting of the Gas Commissioners on Wednesday, when he said he now preferred that the Manager, in place of getting gas for lighting, should receive a money equivalent. The principle of giving anything for nothing was a very vicious one, and no better illustration of this could be found than in the returns which had been laid before them. He supposed not many of the Commissioners were aware that the privilege which their officials enjoyed of receiving free gas was so very largely abused. Ex-Bailie Gentle thought it only fair that the money equivalent proposed should be mentioned; and he did not think, taking into account that only 4 tons of coals were used in the Gas Manager's house, that £33 was a very extravagant sum for gas for heating and cooking, as well as lighting, more especially having regard to the size of the house which Mr. M'Crae occupied. It was only fair to Mr. M'Crae to explain that he used the gas on the assumption that he was entitled to coals and gas under his agreement. Mr. M'Crae was so honourable as to come to the Committee meeting on Monday and offer to pay the Gas Commissioners whatever they might assess the value of the coals to be equal to. The Commissioners, by eight to three, voted delay until further information should be obtained on the subject. At the same meeting, Mr. M'Crae was instructed to amend his return of the analysis of coal by giving the value of coke to be derived in addition to the quantity of gas, and its illuminating power. He was also instructed to advertise for tenders for the tar and ammonia, so as to enable the Commissioners to judge whether it would not be better to sell the raw products, instead of manufacturing them.

The Falkirk Joint-Stock Gas Company have taken a step which may involve them in legal proceedings, in an attempt to close up Canal Street, a thoroughfare which leads from the town to the banks of the Forth and Clyde Canal. The Company recently erected a barricade across the street, which was promptly thrown down by the community; but this act was committed at an hour of the night when it was unobserved, which looks as if the community have no very strong claim to the ground. Meantime the Company have re-erected the barrier, leaving a side postern for foot passengers; but this does not satisfy a portion of the community, and the question is under consideration whether a right-of-way action should not be brought against the Company. At the Town Council meeting on Thursday night, there was a discussion on the subject; but a difficulty presented itself in respect that the Town Clerk and eight members of the Council are shareholders of the Gas Company, and, in consequence, consideration was delayed.

Dundee citizens are proud of their water-works, and during the summer make frequent excursions of the pic-nic order to them. To accommodate these pleasure parties, there is a capacious shelter at Monikie reservoir; and a field has just been entirely set apart for their use. The custom of feasting on the banks of the city reservoirs has, however, apparently some drawbacks, as the Water Commissioners have just given instructions to have a fence erected at a certain place at Monikie to prevent excursionists from using the water for washing.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

Mr. M'Gilchrist, of the Dumbarton Corporation Gas-Works, in his capacity as, so to speak, Perpetual Convener, has issued his usual circular calling the seventh annual informal meeting of Gas Managers, which will be held the week after next in Glasgow, as usual. Mr. Mackenzie, of Dunfermline, will preside. There will not be any formal papers; but several important questions affecting the gas industry will be submitted for discussion. On this occasion the gentlemen composing the meeting will visit the Govan Iron-Works to inspect the very large and complete new plant for recovering and working up the condensable products contained in the blast-furnace gases. This visit will doubtless be of great interest, and afford much instruction. The President and Committee of the North British Association of Gas Managers will be present at the meeting, and take part in the

proceedings. A dinner will take place, as usual, after the proceedings of the meeting proper; and during the dinner, a presentation will be made to Mr. Terrace in connection with his leaving Scotland.

In my last week's "Notes," I referred in a very casual way to the fact that in connection with the year's revenue of the Glasgow Gas Trust so far there had been a very large increase in the receipts from the sales of secondary products; and on this matter I may now be more specific. On Feb. 28, the revenue derived from that source during the financial year beginning June 1, 1889, was £68,537 12s. 10d., as compared with £46,744 5s. 1d. in the corresponding period of the preceding financial year. These figures show an increase over a period of nine months amounting to £18,793 7s. 9d. Of course, as a larger quantity of coal had been used over these nine months, there would be a somewhat greater quantity of tar and liquor to derive revenue from; but the great bulk of the increased income was undoubtedly due to the higher value of the products themselves.

My expectation as to the election of Mr. Alex. Wilson, of the Nine Elms Gas-Works, as the successor to Mr. Terrace, at the Dawsholm works of the Glasgow Corporation Gas Commissioners, has been realized. The election took place at the monthly meeting of the Town Council held on Thursday. After the adoption of the Gas Committee's minutes had been proposed and seconded by the Conveners of the Works and Finance Sub-Committees, respectively, some conversation arose in reference to the appointment of Mr. Wilson. Bailie Macfarlane was the chief objector. He remarked that he saw Mr. Wilson spoken of in the minutes as having been appointed at the full salary received by Mr. Terrace. There was, he said, another assistant at the gas-works not at the full salary; and he asked if it would not have been judicious to have elevated him to the full salary, and appointed the new man at the salary of the other one. He did not wish to make any motion in reference to the matter, but he thought that something should be done to recognize the energies of Mr. Key, the gentleman to whom he referred. They might, he thought, have advanced him instead of going to London for a man. The Convener of the Works Sub-Committee thought this was a matter which had better be left in the hands of the Committee, who would endeavour to do justice to every man in their employment, as they were the most competent judges. The Convener of the Sub-Committee on Finance remarked that he had no doubt that when the proper time came the Committee would advance the position of Mr. Key. In was the opinion of Mr. Mechan, one of the members of the Gas Committee, and Convener of one of the Sub-Committees, that Mr. Key was entitled to some encouragement, as the manufacture of gas was three times what it was when he was placed in charge of the Tradeston works. Mr. Ure objected to the matter being brought up at a Council meeting. It was, he said, a most unusual and imprudent course. The minutes and the recommendation as to Mr. Wilson were then adopted.

Mr. Terrace will very shortly leave to take up his position permanently at Middlesbrough—sooner, I believe, than was at one time expected. In this connection, I may mention that the Glasgow Corporation Gas Committee at their last meeting passed the following special resolution:—"The Committee resolved to record in their minutes an expression of their high appreciation of the valuable and faithful services rendered to this Trust by Mr. David Terrace during the nine years he has occupied the position of Station Manager at the Dawsholm Gas-Works, and their regret at now losing his services. The Committee further resolved that Mr. Terrace be paid the usual premium on the result of the manufacture of gas at said works during the current year; and also that an excerpt from the minutes be sent to Mr. Terrace."

At the meeting of the Glasgow Town Council on Thursday, a long discussion took place in reference to the carrying of electric lighting wires over the roof of the muncipal buildings other than those specially required for the lighting of the City Chambers. The Committee on the New City Buildings had been asked by the Clerk to the Police Board what steps it was proposed to take in reference to those wires; and it was stated in the minutes that the Committee had resolved not to take any action in the matter at present. Towards the close of the discussion, the Convener of the Buildings Committee, Mr. Osborne, said that he had no objection to take the minute back, but pointed out that there was, in regard to this building, not the slightest approach to danger. The Police Board had refused the liberty of carrying the wires underground; and he had no doubt that, if the Police Board withdrew that restriction, the electric light contractors would be too glad to carry the wires underground. It was eventually agreed to remit the minute back to the Committee.

Glasgow Corporation 9 per cent. gas annuities changed hands on the Stock Exchange on Monday at £279; being a decline of £1 from the last price.

Sulphate of ammonia is quoted this week at £11 12s. 6d. to £11 17s. 6d. per ton on spot and forward.

The Glasgow pig iron market has been decidedly demoralized this week. Down to 47s. 10½d. per ton cash was reached on Thursday for Scotch iron. Withdrawals of warrants from the public stores still continue to be on a large scale.

Coals are now declining in price in a number of instances; but in one or two directions some good orders have been booked, and others are expected.

The Gas Supply of Rotherham Out-Districts.—On the recommendation of the Gas Committee, the Rotherham Town Council, at the meeting last Wednesday, decided to extend their gas-mains to the outlying districts of Scholes and Thorpe. This, it is estimated, will involve an outlay of between £2000 and £3000.

Barry and Cadoxton Gas and Water Company.—At an extraordinary general meeting of this Company last Tuesday, resolutions were passed to the effect that £9000 of debenture stock, bearing interest at 5 per cent., be issued *pro ratâ* to the shareholders at par; that 1280 shares of £10 each be created and issued to the shareholders at par, for the general purposes of the water undertaking; and that 1920 shares of £10 each be created and issued for the general purposes of the gas undertaking, upon such terms and conditions as the Directors might from time to time determine.

CURRENT SALES OF GAS PRODUCTS.

LONDON, *April* 5.

Tar Products.—An important tar contract was settled last week at 28s. per ton; and several smaller ones at prices ranging from 25s. to 32s. 6d., according to position. Tar products generally are decidedly "sick;" and buyers are holding off, in the hope of seeing lower prices. With the exception of benzols, for which there is more inquiry, all the other products are neglected and weaker. Even creosote oil, which has been in extraordinary demand for burning purposes, is now being pressed on the market. The following quotations represent transactions during the week:—Tar, 25s. to 32s. 6d. per ton, according to position. Pitch, 28s. 6d. per ton. Benzol, 90 per cent., 3s. 7d. per gallon; 50 per cent., 2s. 7½d. Toluol, 1s. 8d. per gallon. Solvent naphtha, 1s. 8d. per gallon. Crude naphtha, 1s. 2½d. per gallon. Light oil, 4d. per gallon. Lucigen oil, 2⅞d. per gallon. Ordinary creosote, 2⅜d. per gallon. Carbolic acid, 2s. 6d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 4d. per unit; "B" quality, 1s. 1d.

Sulphate of Ammonia.—The low price of nitrate is undoubtedly affecting this market, especially in Germany. Fortunately, makers are well sold, and stocks are low. The home demand does not appear, so far, to have favourably affected prices, although it is admitted to be larger than it has ever been before; the English farmer having at last awakened to the fact of the great value of ammonia for agricultural purposes. Sales are reported at prices ranging from £11 10s. to £11 12s. 6d. per ton, less 3½ per cent., according to position and conditions as to bags and delivery.

Clevedon Gas Company.—The profits of this Company for the year ending Dec. 31 last amounted to £1510; and dividends of 8, 7, and 5 per cent. on the various classes of shares have been declared.

The Extensions at the Leigh Gas-Works.—Last Wednesday week evening the employees at the Leigh Gas-Works were entertained at dinner, at the Courts Hotel in that town, in commemoration of the completion of the extensions at the gas-works. The cost of the repast was defrayed by Mr. Alderman Thorp, Mr. G. Shaw, and Mr. J. Cowburn (contractor for the new tank); and the company numbered about 50. The usual toasts were submitted and duly honoured; and the addition of a little music made the proceedings very enjoyable. At the banquet given to the members of the Board by Mr. G. Shaw, Mr. A. T. Fletcher, the Engineer, responding to a toast in honour of himself, said it was gratifying in every sense to see the completion of any work taken in hand, and to know that it was appreciated. It was an encouragement for the future. That future work would be required was certain; for, notwithstanding the competition which gas, in conjunction with other industries, had to contend with, it was an undoubted fact that it continued to make rapid progress. Mr. J. Timmins, of Wigan (the Consulting Engineer) also referred to the progress which had been made at the Leigh Gas-Works since he became connected with them in 1874.

Antwerp Water-Works Company, Limited.—The report of the Directors of this Company to be presented to the shareholders at their meeting next Thursday states that the income from all sources in the twelve months ending Dec. 31 last amounted to £20,666, against £19,114 in the previous year. After deducting working expenses, interest, &c., the net revenue is £7766. This added to the balance brought forward (£1126), after allowing 5 per cent. of the net profits for a reserve fund, leaves £8504 available for division, out of which the Directors recommend a dividend at the rate of 2½ per cent. per annum, free of income-tax—the balance of £1004 to be carried forward. The Directors state that they are unable to distribute a larger dividend than they did last year without encroaching on the balance brought forward. The increase in the water-rentals in 1889 was only £577; and a dividend of ¼ per cent. amounts to £570. The augmentation of the domestic supply has been counterbalanced by a decrease in trade supplies, and by the very small quantity of water taken by the Municipality. A change has been made in the management at Antwerp (Mr. Devonshire relinquishing the supervision to M. Kemna), by which the Directors hope to be able to effect considerable saving in the working expenses, and thus be in a position to pay an increased dividend. Appended to the report are those of the Antwerp Chemical Commission and the Manager. The former testifies to the efficacy of the Anderson process of purification; and the latter furnishes financial and working statistics for the past year.

Impending Labour Troubles in the Lancashire Coal Trade.—Owing to the Easter holidays, the demand for steam and engine coal in the manufacturing districts of Lancashire has been of a limited character; and prices, as a consequence, have, in the majority of cases, been slightly easier. The settlement of the Dock labourers' strike at Liverpool has given a slight impetus for export; but, generally speaking, trade is dull, and most of the collieries have been closed four days—work being resumed this (Tuesday) morning. A number of strikes are threatened in the South-East Lancashire coal-fields, regarding the recent advance; and further trouble is anticipated from the banksmen who did not participate in the advance conceded last month by the employers. The colliers say that, when the last advance was promised by the masters, it was on the understanding that it would be paid on the gross earnings; but, as a matter of fact, they are not receiving it for the yardage and odd work. The men employed at Stone's Colliery, Wigan, have struck work; and other strikes are expected in the Pendlebury and Kersley districts on the subject. Deputations of men will wait upon the employers, however, before anything definite is done. In the case of the banksmen—that is, the men employed on the pit-banks—it is said they only earn from 3s. 2d. to 3s. 8d. per diem, and are only able to put in four or five days' work a week, having to play when the colliers do. An agitation is on foot to secure these men an advance; and very likely a separate Union will be established for them. At present their leaders do not advise a strike, but suggest that the masters be interviewed on the subject of a 10 per cent. advance.

Stalybridge Corporation Gas Supply.—The make of gas during the year ended the 25th ult. was 126,517,500 cubic feet—an increase of 3,420,700 cubic feet on the previous twelve months. This increase has been obtained from a smaller quantity of coal; the number of tons carbonized during the year being 101 less than in the previous twelve months. The Gas Committee decided last week to recommend the Council to increase the salary of the Manager (Mr. E. A. Loam) by £20 per annum. The recommendation will come before the Town Council at their meeting to-day.

The South Metropolitan Gas Company and Unionist Stokers.—As already stated in our columns, the Directors of the South Metropolitan Gas Company have decided not to employ in future any stokers or other workmen who are members of the Gas Workers' Union. The reason for this decision is set forth in the following notice, which has been posted up at the various stations of the Company:—"In the *Western Morning News* of Monday, the 17th of February, 1890, there is a report of a speech made on the previous Saturday evening, to a meeting of the Plymouth Branch of the Gas Workers' Union, by Mr. Thorne, Secretary of the Union. In that speech Mr. Thorne is reported to have said 'he warned the consumers of London that the men would not give seven days' notice again before striking.' After this plain declaration that the Gas Workers' Union intends to break the law, the Company must do what is necessary to protect the consumers of gas and the public. Notice is therefore given that no member of the Gas Workers' Union will be employed by the Company."

The Thirlmere Water-Works of the Manchester Corporation.—A union has been effected between the north and south workings of the tunnel which has had to be made through Moor How, a large hill about two miles east of Windermere village, in connection with the Thirlmere water-works. The length of the tunnel is 3040 yards, with a length of "cut and cover" of between 600 and 700 yards more. The larger part of the tunnel has had to be cut through solid rock, and will therefore need no facing, being as nearly water-tight as possible; but in parts a lining of concrete will be necessary. The work has been proceeding between three and four years; and the weekly progress has varied from 12 to 18 yards. At the meeting of the Manchester City Council last Wednesday, the Deputy-Chairman of the Water Committee (Mr. Bosdin) stated that contract No. 4 for the Thirlmere scheme had been re-let for the sum of £134,869, and that the whole of the works were in full progress.

The Northern Coal Trade.—The course of the northern coal trade has been decidedly weaker during the past few days, despite the lessened production owing to the holidays. As yet, the shipments to the Baltic ports are limited, and the falling off in the inquiry for gas and household coal is very large; so that there is a much lower demand. For best Northumbrian coals, the price is now about 12s. 6d. per ton, free on board in the Tyne—small steam coals being 8s. per ton; but inquiries for shipment after the holidays are rather limited. Gas coal is steady, and is still scarce, owing to the fact that one or two large collieries have been idle for a little while for special reasons. The price of best gas coals is now about 13s. per ton, free on board; and supplies are likely to grow fuller just now, owing to the lessening consumption. The gas companies, however, despite the competition of the electric light, are taking full quantities of coal for this season; for in many instances the gas supplied in the first quarter of the year has been far above that in the same quarter of last year. Household coal is very dull; and certain collieries are now beginning to work short time. Bunker coals are falling in price; the supply being more abundant. Coke is also lower—best Durham being quoted at 26s. per ton, free on board in the Tyne; but the demand for gas coke shows very little alteration.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

For Stock Market Intelligence, see ante, p. 638.

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	17½—18½	..	5 13 6
100,000	10	,,	7½	Do. 7 p. c	10	12—13	..	5 15 9
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	109—111	..	4 10 1
100,000	20	28 Nov.	8	Bahia, Limited	20	20—21	..	7 12 4
200,000	5	14 Nov.	7½	Bombay, Limited	5	6—6½	..	5 15 4
40,000	5	,,	7½	Do. New	4	4⅝—5⅛	..	5 17 10
380,000	Stck.	27 Feb.	12½	Brentford Consolidated	100	217—222	..	5 10 4
125,000	,,	,,	9½	Do. New	100	160—165	..	5 12 2
220,000	20	13 Mar.	11	Brighton & Hove Original	20	40—42	..	5 4 9
320,000	20	28 Mar.	11½	British	20	44—46*	..	4 17 10
50,000	10	13 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	12½—13½	..	7 8 2
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	105—108	..	5 11 1
150,000	20	27 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13⅝	Commercial, Old Stock	100	252—257	+2	5 7 0
130,000	,,	,,	10⅝	Do. New do.	100	200—210	..	5 2 4
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	3 13 2
557,320	20	12 Dec.	13	Continental Union, Limited	20	46—48	+½	5 8 4
242,680	20	,,	13	Do. New '69 & '72	14	31—33	..	5 10 3
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	195—205*	..	4 17 7
234,060	10	30 Jan.	13	European, Limited	10	24—26	+1	5 0 0
120,000	10	,,	13	Do. New	7½	18—19	+½	5 2 10
354,060	10	,,	13	Do. do.	5	12½—13½	+½	4 16 4
5,470,620	Stck.	13 Feb.	13¾	Gaslight & Coke, A, Ordinary	100	249—254	+3	5 8 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—103	..	3 17 8
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	..	3 18 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	121—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	180—185	..	4 1 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	160—165	+1	4 4 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	247—252	..	3 19 4
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	114—117	..	3 8 5
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—127	..	3 10 10
650,000	,,	,,	6	Do. 6 p. c. do.	100	160—170	..	3 10 7
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	219—224	+2	5 7 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5⅛	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	112—114*	+½	4 7 9
541,920	20	28 Nov.	6	Monte Video, Limited	20	18¾—19¾	..	6 3 1
150,000	5	28 Nov.	10	Oriental, Limited	5	8½—9	..	5 11 1
60,000	5	28 Mar.	7	Ottoman, Limited	5	5½—6*	..	5 16 8
166,870	10	26 July	4	Para Limited	10	3½—4½	..	8 17 9
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	16 Oct.	10	San Paulo, Limited	10	14⅝—15½	..	6 9 2
500,000	Stck.	27 Feb.	13½	South Metropolitan, A Stock	100	280—290	+5	4 11 5
1,350,000	,,	,,	11⅔	Do. B do.	100	225—235	+5	4 17 10
141,500	,,	,,	12	Do. C do.	100	235—245	+5	4 17 11
650,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137—142	..	3 10 5
60,000	5	27 Feb.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
728,446	Stck.	30 Dec.	9½	Chelsea, Ordinary	100	260—265	..	3 11 8
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	210—215	+1	3 9 9
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	143—148	..	3 0 10
700,000	50	12 Dec.	9	Grand Junction	50	120—125	−1½	3 12 0
708,000	Stck.	13 Feb.	10½	Kent	100	271—276	..	3 16 0
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	254—258	..	3 13 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	122—126*	..	3 3 6
500,000	100	13 Feb.	12½	New River, New Shares	100	362—367	+2	3 6 1
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,300	Stck.	12 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	160—165	..	3 12 9
126,500	100	,,	6	Do. 7½ p. c. do.	100	157—162	..	3 14 1
155,966	Stck	12 Dec.	10	West Middlesex	100	260—265	..	3 15 6

*Ex.div.

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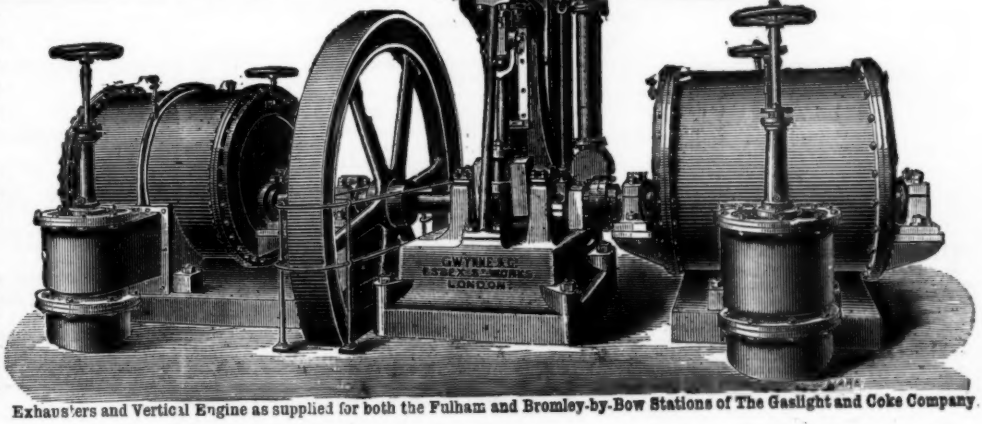

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WANTED, by an experienced Man, a SITUATION as WORKING FOREMAN. Is capable of taking charge of small Works. Can lay Mains, Services, and do General Repairs on the Works. Sixteen years' good character

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WANTED, a Gentleman with good Connection to represent Messrs. R. Laidlaw and Son, Gas and Water Meter Manufacturers, in the Lancashire and Yorkshire Districts.

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CHARLES EDWIN JONES, C.E.
Chesterfield, April 3, 1890.

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SURPLUS TAR AND AMMONIACAL LIQUOR.

THE Directors of the Tamworth Gaslight and Coke Company are prepared to receive TENDERS for the purchase of all surplus TAR and LIQUOR, for a period of Two years, from May next.

Full particulars may be had from
WILLIAM ARNOLD, Secretary.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Victoria New- market Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the surplus TAR and LIQUOR made at their Works during the ensuing Twelve months, ending March 25, 1891.

Tenders, stating price per 1000 gallons delivered free on Rails at Newmarket Station, to be sent to the undersigned on or before the 18th day of April, 1890.

The Directors do not bind themselves to accept the highest or any tender.

By order,
THOMAS WILKINSON,
Manager and Secretary.
Gas-Works, Newmarket, April 2, 1890.

GLASGOW CORPORATION GAS.

THE Glasgow Corporation Gas Com- missioners invite TENDERS for the supply of such METERS (Dry and Wet) as they may require for Twelve months from the 1st of May, 1890.

Forms of tender may be had on application to the Manager, at the Gas Office, 45, John Street, Glasgow.

Sealed Offers, marked "Tender for Meters," to be addressed to, and lodged with, the Subscriber on or before Tuesday, the 22nd current.

The Commissioners do not bind themselves to accept the lowest or any tender.

J. D. MARWICK, Town Clerk.
City Chambers, George Square,
Glasgow, April 1, 1890.

TIMMIS & CO., of STOURBRIDGE, Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

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*** See Advertisement p. 623 of last week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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Telegraphic Address: "Braddock, Oldham."

GAS-WORKS IN BRUSSELS.

TAR FOR SALE.

THE Communal Administration of Brussels will proceed on the 20th of May, 1890, to open TENDERS for the purchase of TAR produced from the Gas-Works, from the 1st of October, 1890.

The Contract is divided into Two Lots—the first comprising 3600 tons; and the second, 5400 tons.

For full particulars, address M. LE DIRECTEUR DE L'USINE A GAZ, Rue du Chêne 8A, BRUSSELS.

HONITON GAS-WORKS.

THE Directors of the Honiton Gas and Coke Company, Limited, invite TENDERS for the Erection of a GASHOLDER complete, including Brick Tank and all Connections, at their Works as above.

Capacity, not less than 22,000 cubic feet.

Plans may be seen, and every information obtained, at the Works, or copy of plan and specification of the Holder may be had upon application to the Engineer, upon payment of £1 1s.

Sealed tenders to be addressed to the Secretary on or before the 23rd of April, 1890.

The lowest or any tender not necessarily accepted.
March 29, 1890.

GAS PLANT FOR SALE.

THE Wigan and Whiston Coal Com- pany, Limited, Prescot, are prepared to receive TENDERS for the whole or any part of their GAS PLANT, consisting of Morton's Patent Mouthpieces, Ascension, Seal, and Dip Pipes, 74 feet of Hydraulic Mains (20 in. by 20 in. U shaped), Condensers (two rows of 2 feet diameter Pipes, three heights, by 56 feet long), Two Tar Extractors (10 ft. by 2 ft. diameter), 81 feet of 14-inch diameter Pipes, Two Anderson's Four-way Valves, Gas Governor by Orme, Exhauster, Holder (25 ft. by 9 ft.), with Cast-Iron Tank (26 ft. by 9 ft.), bolted together in segments, Purifier (8 ft. by 6 ft.), Two Scrubbers, &c.

The whole of the Plant will be put free on Trucks.

For further particulars, or to view, apply to the above-named Company.

The highest or any tender not necessarily accepted.

TO STEEL-PIPE MAKERS.

THE Sheffield United Gaslight Com- pany are prepared to receive TENDERS for the supply of a circular STEEL FOUL GAS MAIN, of about the following quantities:—viz., 585 feet of 30 inches diameter, 160 feet of 24 inches diameter, and 210 feet of 12 inches diameter Pipes, with all necessary Bends, Tees, &c.

A copy of the drawings, with further particulars, may be obtained on application to the Company's Engineer, Mr. Fletcher W. Stevenson.

A charge of 10s. 6d. will be made for each copy of the drawings supplied.

Sealed tenders to be delivered to the undersigned on or before Monday, the 14th of April next, endorsed "Tender for Foul Main."

The Company do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
March 24, 1890.

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TENDERS required as below:—

For Turned and Bored and other Pipes, Bends, Tees, Syphon Wells, and other Irregular Pipes.
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For Retort Mouthpieces, Stand-Pipes, Door Frames, Special Bends, Tees, Flange Pipes, &c.
For Wrought-Iron Tubes.

Samples may be seen on application at the Stores Department, 21, Dewsbury Road; and forms of tender and specification may be had of Mr. Lupton, at the Offices of the Gas Department, Municipal Buildings.

Sample bundles of ¾-inch tubes to be sent addressed to the Stores Department aforesaid not later than Saturday, the 12th inst.

Endorsed tenders, addressed to the Chairman, will be received not later than Wednesday, the 16th inst.; and no tender will be considered except on the form provided.

The lowest or any tender will not necessarily be accepted.

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BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

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EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890: Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

PATENTS, DESIGNS, AND TRADE MARKS ACT, 1883.

NOTICE is hereby given that the Dinsmore Gas Company, Limited, of 14, Batavia Buildings, 12, Hackins Hey, Liverpool, Co. Lancaster, has applied for leave to amend the specification of Letters Patent No. 7714, of 1887, granted to John Henry Richardson Dinsmore, for "Improvements in and connected with the Manufacture of Illuminating Gas from Coal."

Particulars of the proposed amendment are set forth in the Illustrated Official Journal (Patents), issued on the 26th of March, 1890.

Any person may give notice (on Form G), at the Patent Office, 25, Southampton Buildings, London, W.C., of opposition to the amendment, within One month from the date of the said Journal.

(Signed) H. READER LACK.
Comptroller General.

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A GUIDE TO THE STUDY OF THE

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Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

Chemist and Superintending Gas Examiner to the London County Council.

The aim of the Author has been to give a comprehensive account of the various methods of Photometry in daily use, and to make the book thoroughly practical by indicating the many precautions necessary for ensuring accurate results in photometrical work. The volume contains chapters on the History and Principles of Photometry; Horizontal, Radial, and Jet Photometers; Standards of Light; the Proposed Substitute for Candles; the Auxiliary Apparatus required in Testing Gas; the Examination and Adjustment of a Gas-Testing Photometer; and Colour and Stellar Photometry; together with an Appendix comprising the Notification of the Metropolitan Gas Referees, Tables for the Correction of Volume of Gas and Observations of Candles, and other matter useful to Photometrists.

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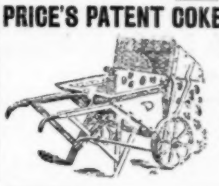

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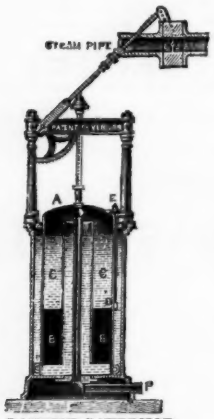

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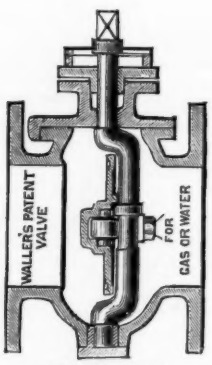

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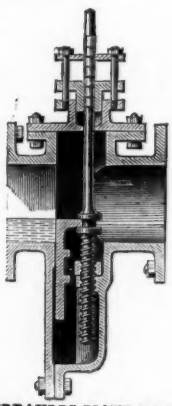
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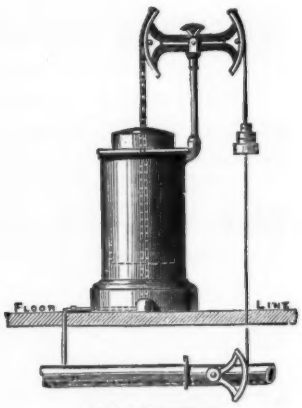

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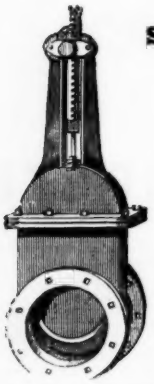
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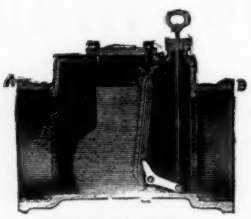
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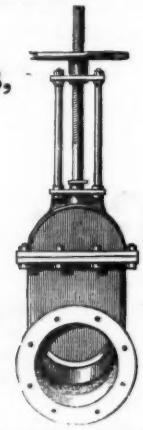
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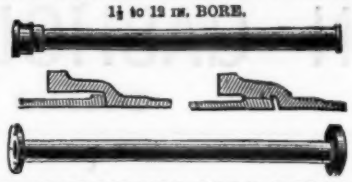

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THOMAS SPITTLE, LTD.
[ESTABLISHED OVER 50 YEARS.]
CAMBRIAN FOUNDRY, NEWPORT, MON.,
MAKERS OF
CAST-IRON PIPES FOR GAS, WATER, AND STEAM.
ALSO
Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.
ALSO ALL WROUGHT-IRON WORK.
THE LARGEST MAKERS IN WALES.

STREET-LAMPS,
ORDINARY OR
OUR SPECIAL HIGH-POWER.
The best Lamps in the Trade.
Street-Lamp Governors. Gas-Meters.
HULETT'S
SERVICE CLEANSER.
No Gas Company should be without this Apparatus.
THOUSANDS IN USE.

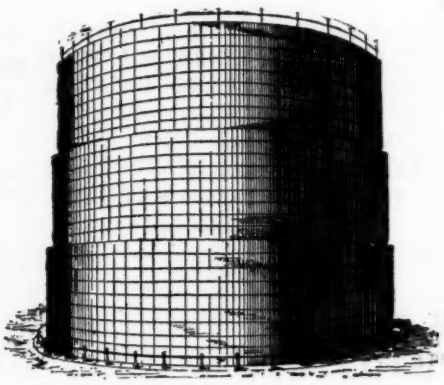
Every Description of Gas-Fittings, Pressure-Gauges, &c.
D. HULETT & CO., LIMITED.
55 & 56, HIGH HOLBORN, LONDON.

REVOLUTION
IN GASHOLDER CONSTRUCTION.
(GADD & MASON'S PATENTS.)

IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.

NO COLUMNS. NO FRAMING
NO COLUMNS. NO FRAMING.
NO COLUMNS. NO FRAMING.

NO PIERS ROUND TANK.
NO PIERS ROUND TANK.
NO PIERS ROUND TANK.



IMMENSE SAVING IN COST.
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NO COLUMNS. NO FRAMING.
NO COLUMNS. NO FRAMING.
NO COLUMNS. NO FRAMING.

NO PIERS ROUND TANK.
NO PIERS ROUND TANK.
NO PIERS ROUND TANK.

GREATER STABILITY. TILTING IMPOSSIBLE.

Tank Construction rendered far simpler and very much cheaper; the Piers and heavy Base Stones being dispensed with.

In Holders for Export a very large additional saving is effected in Carriage, Freight, Transport, and Insurance; the weight being reduced nearly **50 per cent.**

Admitted by eminent Engineers to be the system of the future.

Our Alternative Arrangements of Torsional and Tensional Gearing WE DO NOT RECOMMEND. The former, by means of Geared Shafting, or Rack and Pinion, IS CLUMSY; whilst the latter, by means of Chains or Ropes, IS UNRELIABLE AND DANGEROUS.

Engineers intending to extend their Gas Storeage should not fail to see the TWO-LIFT HOLDER erected for the Northwich Gas Company.

PLANS, SPECIFICATIONS, AND ESTIMATES SUPPLIED.

Telegrams: "SPIRAL MANCHESTER."

The PATENT GASHOLDER SYNDICATE,
504, STOCKPORT ROAD, MANCHESTER.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected, including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

ORME'S GAS REGULATOR FOR STREET LAMPS

No. 200.
LAMP REGULATOR
Full Size.

(Behl's Patent)

Adopted by the leading GAS COMPANIES AND CORPORATIONS.

More than 150,000 now in use.

Strongly made, all Brass, as Illustration No. 200,

Price, 24/- per dozen.

ORME'S GAS REGULATOR

(BEHL'S PATENT),

No. 201, 202, 203, FOR DOMESTIC USE,

Saves from 20 to 50 per cent. of Gas.

Gives a bright and steady Light.

Price, 15/- per dozen.

SAMPLES UPON APPLICATION.

No. 201, ⅜ B Socket.
„ 202, ⅞ B Socket.

No. 203, Taper Screw.

STREET LANTERNS OF NEW DESIGNS.

IMPROVED LAMP TORCHES.

ALL BRASS. EXTRA STRONG.

PRICE LIST AND FULL PARTICULARS UPON APPLICATION.

GEORGE ORME & CO., ATLAS METER WORKS, OLDHAM.

Telegraphic Address: "ORME OLDHAM."

BELL'S ASBESTOS AQUOL PAINT

TRADE MARK.
BELL'S ASBESTOS

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN, BARCELONA, and ANTWERP.
AGENTS—BIRMINGHAM: BELL and Co., 7, John Bright Street. CARDIFF: BELL and Co., West Bute Street.

BELL'S ASBESTOS

EXPANSION SHEETING.

The above, which can only be obtained from this house, is recognized as the **most efficient and economical jointing material in use.** It is composed of a specially-prepared India-rubber Compound, protected by a covering of Vulcanized Asbestos Sheeting, as shown above; and as it is the only Jointing Material which adequately **combines permanent elasticity with heat resistance,** the advantage it possesses will at once be seen.

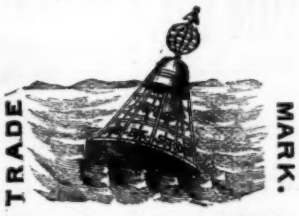
EXPANSION RINGS.

The centre from which the requisite elasticity is obtained will adapt itself to uneven surfaces to which it may be applied, and allow the expansion and contraction to be fully taken up. The covering being of Asbestos Cloth imparts a protection to the centre, and so prolongs its elasticity. **For Manhole, Mudhole, Steam Pipe, and Mash Tun Door Joints, it is unequalled;** and if applied as directed, **a ring can be used many times over.**

Made from 1-Ply for Cylinder and Faced Joints to any thickness for Uneven Surfaces.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.
MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
GLASGOW: 35, Robertson Street.
DUBLIN, BERLIN.

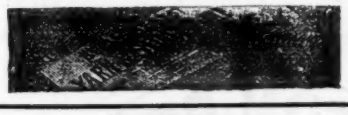


BELL'S ASBESTOS.

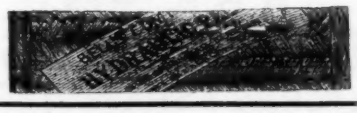
DEPÔTS.
BARCELONA, and ANTWERP.
AGENTS.
BIRMINGHAM: BELL and Co., 7, John Bright Street.
CARDIFF: BELL and Co., West Bute Street.

Southwark, London, S.E.

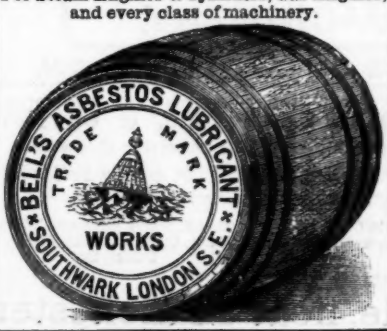
BELLS ASBESTOS
YARN AND SOAPSTONE PACKING
Is the BEST LOCOMOTIVE PACKING made.



BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.



BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



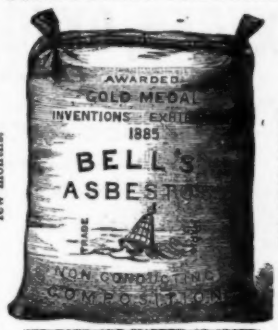
BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.
Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
"DAGGER" PACKING
Is unequalled for every kind of Marine and Land Engine, Steam-Pumps, &c., and has proved itself to be the most efficient, durable, and economical Packing made.

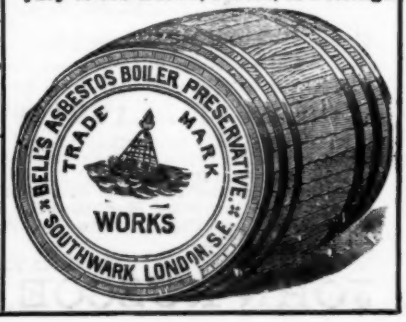
BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.
Will reduce loss by radiation, and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



Can be applied again after many years' service. Is sent out dry in bags: therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

PATENT GLASS LAMPS & COVERS

For Streets, Railway Platforms, &c., &c.

(Patented the 4th of May, 1889.)

This Lamp and Top, being made entirely of Glass, is perfectly impervious to corrosion, and therefore invaluable in Manufacturing and other Towns. The Top can be had in clear or coloured Glass; and is much cheaper than the old style of metal frames. The New Lamp can be adapted to the old metal frame top.

Prices on application.

PILKINGTON BROS.,
Glass Works, St. Helens, Lancashire.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS,

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

OXYGEN, OXYGEN, OXYGEN.

(Extracted from the Atmosphere by **Brin's Patent Process.**)
40,000 cubic feet always in Stock.

Managers of Gas-Works supplied with Oxygen compressed in Weldless Steel Cylinders, for experimental purposes, &c., at special rates.
Estimates given for the erection of Oxygen Producers in Gas-Works, &c.
Managers of Gas-Works specially invited to inspect our Works.

The Manchester Oxygen (BRIN'S PATENT) Co., Ltd.,

GREAT MARLBOROUGH ST., OXFORD ROAD,

MANCHESTER.

Manufacturers and Compressors of all kinds of Gas.

THE ÉTOILE GAS-LAMP

(REGENERATOR).

Sole Makers and Proprietors,

THE ÉTOILE GAS-LAMP COMPANY,

Gas Lighting and Ventilating Engineers,

PRINCESS STREET, MANCHESTER.

LISTS ON APPLICATION.

F. & C. OSLER,

(ESTABLISHED 1807)

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES,

TABLE GLASS OF ALL KINDS,

CHANDELIERS IN BRONZE AND ORMOLU.

MODERATOR LAMPS.

100, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES.

153 TO 155, CANNON STREET,
LONDON BRIDGE, E.C.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

LONDON OFFICE, 60, QUEEN VICTORIA ST., E.C.

CLAYTON SON & Co LIMITED, LEEDS.

MAKE

RETORT LIDS

OF ALL FORMS & SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

FACE YOUR RETORT MOUTHPIECES.

JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

PATENT TWISTED TAPS, DIES, & CUTTERS.

Thousands in constant work, give universal satisfaction.

Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

Main Drilling Stand, with Cup Drills, 1¼ to 6 inch; Taps, Rymers, and Drills.

Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides, &c.

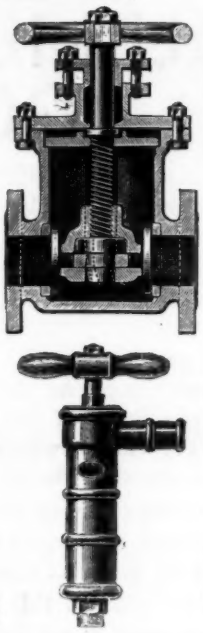
Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

W. H-SPENCER & CO.,

HITCHIN, HERTS,

— ENGINEERS. —



PATENT CAM FULL-WAY VALVES,

1 INCH to 8 INCHES,

Instantaneous Grip and Release, occupying less Space than any other Full-Way Valve; made with either Internal or External Spindle. Gun Metal or Phosphor Bronze Valves, Seats, and Spindles.

Prices on Application.

CAST-IRON SYPHON PUMPS.

2½ by 6 in. Stroke - - £1 10 0 each.
2½ by 9 in. „ - - £1 16 0 „

WROUGHT-IRON DITTO.

2½ by 6 in. Stroke - - £1 13 6 each.
2½ by 9 in. „ - - £1 19 6
NET.

S. PONTIFEX & CO.,

GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,

LANTERN COCKS, REGULATORS,

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT

LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

BOX'S PATENT

PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.

Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL.

Address, THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

RETORT SETTINGS IMPROVED

BY ADOPTING

THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.

HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

J. & H. ROBUS,

CONTRACTORS FOR GAS AND WATER WORKS,

20, BUCKLERSBURY, LONDON, E.C.

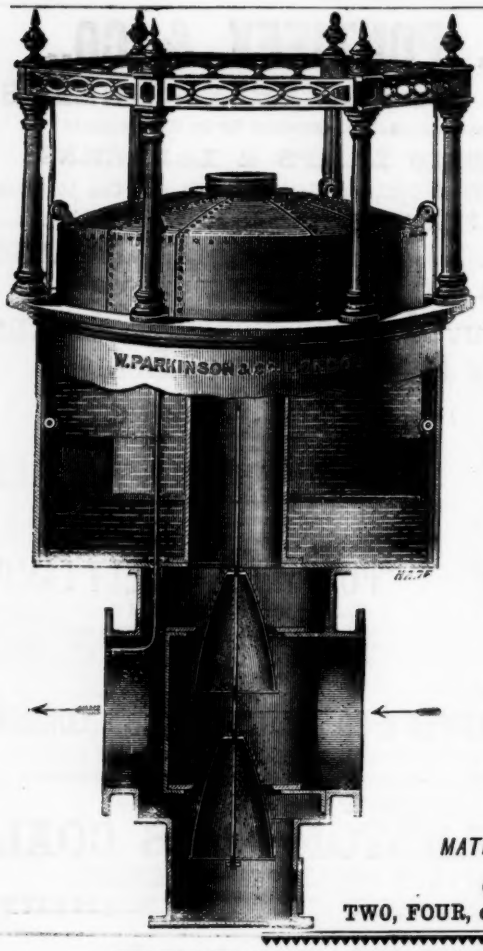
ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.



PARKINSON'S
IMPROVED
EQUILIBRIUM GOVERNOR.

This Governor combines all the advantages of simplicity with perfect efficiency. It effectually overcomes the difficulty of varying pressures experienced by many Engineers owing to the change of light and heavy gasholders, and other causes.

Two parabolic cone valves are employed, one fitted above the other, as shown in the Engraving. By this means the flow of gas is divided, and passes equally through the valves, which are in perfect equilibrium, whatever position they occupy.

No "compensating arrangements" are therefore needed; no attention is required; and the management of the Governor is made as simple as it possibly can be.

In actual practice this Governor is found to be perfect in its action; and every detail in construction is carried out with the utmost care.

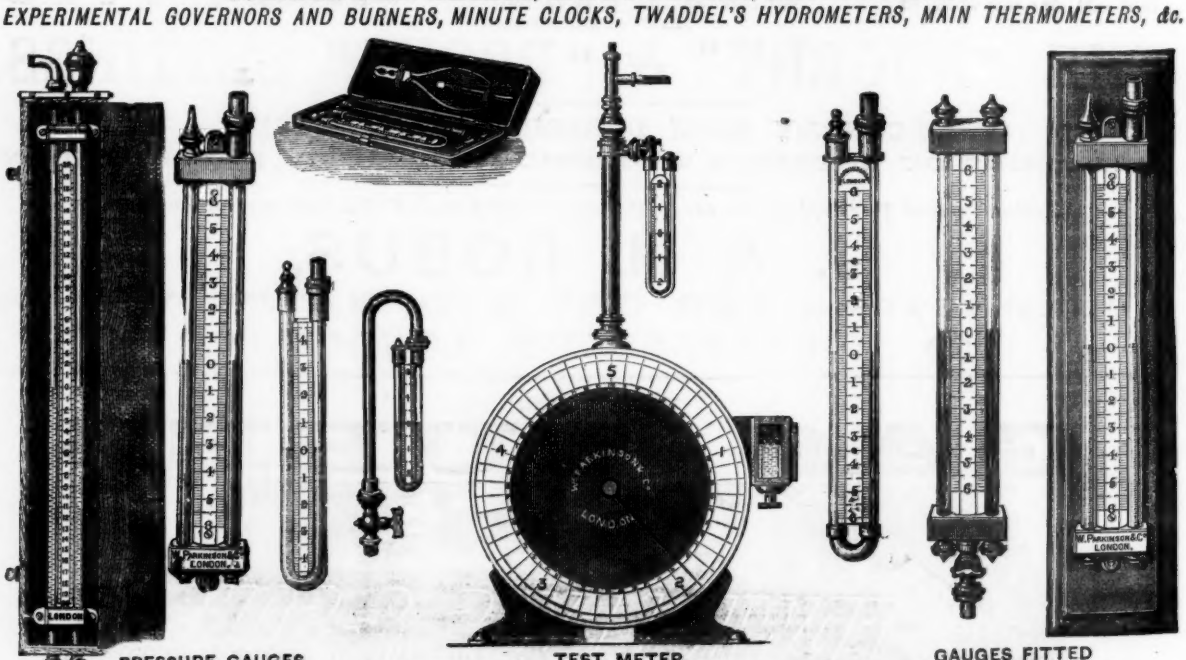
MATERIALS AND WORKMANSHIP OF THE VERY BEST QUALITY.

COUNTERBALANCE or AIR VESSEL, as desired.
TWO, FOUR, or SIX COLUMNS and GIRDERS.—WEIGHTS or WATER PRESSURE.

EXPERIMENTAL APPARATUS.

TEST METERS { For Official Inspectors and others, fitted with Parkinson's Patent Three-partition Drums. A 100-light Meter has recently been made for the City of London Corporation, and Stamped by the Board of Trade as a Standard Instrument.

SULPHUR-TEST METERS, KING'S GAUGES, PHOTOMETERS;
EXPERIMENTAL GOVERNORS AND BURNERS, MINUTE CLOCKS, TWADDEL'S HYDROMETERS, MAIN THERMOMETERS, &c.



PRESSURE GAUGES In every Size and Style.

TEST METER For Burners, with Enamel Ring Dial and Slate for marking off. A most useful and necessary Instrument for every Gas Manager.

GAUGES FITTED On Mahogany or Porcelain Backs or in Polished Wood Cases.

GOLD & SILVER MEDALS, Health Exhibition, London, 1884. SILVER MEDAL, Inventions Exhibition, 1885.

FULL PARTICULARS AND PRICE ON APPLICATION TO

W. PARKINSON & CO., GAS ENGINEERS, COTTAGE LANE WORKS, CITY ROAD, LONDON.

Telegraphic Address: "INDEX LONDON."

[See also Advt., p. 634.

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